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Executive Summary

The creation of an international advisory board that would communally develop MEI as a comprehensive music notation data model for the intellectual and physical characteristics of music notation was the primary goal of the collaborative and collective endeavors of this workshop year.

The first workshop in Charlottesville, Virginia, from July 29-31, 2009 (with 17 scholars coming from the fields of computer sciences, libraries, musicology, and music editing and analysis) concentrated on three main aspects: 1) the commitment of MEI to a user-centered focus, 2) the potential of MEI as a scholarly encoding format, and 3) the determination of the functional requirements for MEI.

On one hand, the group decided to maintain the widest possible range of uses of MEI in mind in order to prevent a narrowed scope. However, on the other hand, one of the clearest results of the discussions was the necessity of a stable version of MEI with comprehensive documentation as a precondition for the development of further tools. The power of MEI as a scholarly encoding format was clearly demonstrated during the detailed and intensive discussions of short, but detailed examples from the field of historical notation mostly drawn from manuscript sources. The decision to establish several sub-groups of the MEI board dealing with technical questions (such as the creation of a tag library, suitable documentation, and the use of RelaxNG or ODD for the MEI scheme), a list of functional requirements and the continued collection and encoding of examples proved to be very effective since this distribution contributed to real progress in the collaborative work between the two workshops.

By the time of the second workshop in Detmold, Germany, from March, 15-17, 2010, now with 21 participants, the RelaxNG MEI schema was almost complete, a near-final version of the tag library had been circulated, a functional requirements document had been posted for comment, and the members of the group had been engaged in lively conversation via the MEI listserv.

The Detmold meeting, which began with detailed reports on the current state of the MEI activities and the authoring of a “to-do” list, was guided by three main topics: 1) The “Working with MEI” section proved most surprising because there were eight reports from the participants, clearly demonstrating the advantages of work with MEI in different fields and the progress since the Charlottesville workshop. 2) A concept for dissemination and teaching MEI was discussed; this finished by establishing a sub-group charged with outlining further goals and plans for realization. 3) Intensive debates of organizational aspects and political perspectives, including property rights issues, led to decisions concerning the future work of the MEI Council.

Continued work until the May deadline for the workshop project led to numerous concrete results: 1) The MEI schema is now available in a stable version 2010-05 as an RNG schema at the new MEI website, while a utilization of ODD is planned to begin in August 2010. 2) A complete tag library is also ready for download at the website. 3) Furthermore, the new MEI website includes sample encodings, a first tutorial for MEI, a bibliography, information about on-going projects and upcoming events, a short history of MEI and an outline for a comprehensive structured list of notational and editorial examples. Additionally, there is an MEI discussion list. 4) The Organizational structure of MEI has been fixed in the establishment of an MEI Council, a Technical Committee, Council-Co-Chairs and an Advisory Board. 5) Detailed dissemination and teaching plans have been developed and members already took part in lectures and workshops communicating MEI activities. 6) Special applications are under development, including an MEI score editor and further conversion tools. 7) The MEI community strongly supported the plan for a new DFG/NEH-Bilateral Digital Humanities Program: Enriching Digital Collections proposal.

Finally, the fact that several new projects plan to integrate MEI in their work (certainly bringing new challenges for the MEI encoding) is a promising signal that will certainly stimulate the future collaborative work of the newly-founded MEI Council.

Project Activities

With collaboration and collective development as the primary goal for this workshop year, one of the major outcomes of this grant was to create an international advisory board that would communally develop MEI as a comprehensive music notation data model for the intellectual and physical characteristics of music notation documents (including the treatment of librettos, scholarly editorial apparatus, etc.) – a model which is able to manage complex source situations and improve searching, retrieval and displaying notated music online, thus benefiting music scholars, performers, and publishers. The expertise required on this board needed to be broadly representative with technological skill sets as well as musical specializations ranging from early (pre-1750) to twenty-first century music. It was hoped that this level of inclusiveness would make development more relevant and contribute to quick adoption.

The willingness to take part in this process was astonishing. Nearly all scholars who had been invited by the organizers on the basis of their historical or technical expertise with notational and editorial problems emphasized their vital interest in the process of transforming MEI into a community-driven encoding format. This interest was also visible in the fact that the call for a collection of examples with notational problems which might serve as a base for the Charlottesville discussions was met by an overwhelming response. Within a very short span of time, even members who were not able to take part in the first meeting contributed to a collection of more than 130 examples to the MEI Collab site at U.Va. Furthermore, a list of basic literature about music notation, encoding and XML-techniques was made available before the first workshop. In several virtual meetings, an agenda (provided as Appendix 3) was fixed by the organizers.

Charlottesville Workshop

The first of our two workshop meetings occurred in Charlottesville, Virginia from July 29-31, 2009. The challenges associated with pulling together such a large group of scholars on different academic schedules and living on different continents became immediately evident and our initial list of participants had to be revised before the first workshop. Because of the need to have different disciplines and areas of music specialty represented, replacements had to be thoughtfully selected. The participants in the Charlottesville workshop are listed with their expertise/specialty areas in Appendix 1.

Being the first attempt to collaboratively design a music notation data model that focused on scholarly use, and to build community, the Charlottesville meeting focused on the development of the model from a high level. Introductory sessions on community building and an introduction to XML for the non-technicians in the group helped participants focus. The main aspects of the discussions may be summarized in three points:

1. Commitment to a user-centered focus

Central to the mission of MEI is the commitment to user driven development – with its strength lying in its public openness and progress being driven by the scholarly community. For this reason, it was essential for the MEI Council to articulate who MEI was being developed for and to ensure users and users were forefront in development decisions. The following wide field of possible and likely uses for MEI were identified: music theorists and analysts, performance analysts (for numerical or structural analysis), music historians (genesis of compositions), music editors (handling of versions, variants, genetic aspects, annotations), music librarians (metadata, identification, searching, storage of variants, text,

annotations), psychologists (perception and cognition, control tests), composers (in so far as notated music is concerned), students of notational issues, instructors (pedagogical applications), performers (performing editions), ethnomusicologists, computer scientists and engineers.

While music historians, librarians and editors are the main focus of MEI in the initial phase, the group must maintain the widest possible range of uses in mind in order to prevent a narrowed scope that cannot serve the broadest range of needs.

2. *The potential of MEI*

In his initial presentation of the current development of MEI, P. Roland dealt with its basic modular structure, application to major repertoires, musical domain questions, the handling of editorial or scribal changes in manuscripts, inclusion of facsimiles, treatment of non-musical text and images, aspects of text underlay in vocal music and the question of sound output. J. Kepper, D. Röwenstrunk and R. Viglianti added introductory overviews of tools for MEI. While analysis, sound and metadata tools are still missing, in the case of score-rendering, the MEI neumes viewer offers a guide to the possibilities. XML-tools, such as the oXygen editor, facilitate score-writing and helped Kepper and Viglianti to fix and control their example encodings. Further help is offered by transformation scripts already existing (MEI to MIDI by P. Billam, MusicXML to MEI and MEI to MUP by Roland). A clear result of the discussions was the necessity of a stable version of MEI as a precondition for the development of further tools. A second point was the need for comprehensive documentation of MEI. The plan for a user tutorial and usage guidelines with notation and encoding examples was fixed and C. Sapp promised to deliver a set of short examples for this tutorial. It was also planned to initially provide the guidelines in a Wiki version, but to ultimately integrate them in a literate programming solution such as ODD (One Document Does-it-all).

3. *MEI Functional Requirements*

With representation of the semantic and structural complexity of the entire diverse history of Western notation as a goal, the group undertook the very difficult task of determining the functional requirements for MEI. Since the requirements are so intimately tied to the intricacies of music notation itself, the above mentioned list of examples, thematically structured by Selfridge-Field and Veit in two papers circulated during the workshop, guided the discussions. Through a series of intense, collaborative discussions, the group systematically debated many of the musical features from these lists and how they would best be treated in MEI. Beginning with relatively simple specifications, such as issues of pitch and duration, the group moved on to some of the very difficult questions and dealt with the problems of *colla parte*, repetition variants, tablature, complex chord-combinations, uncertainties of notation (e.g., accent versus *dim.* wedge), manifold forms of music-text-combinations, multiple interpretation of source-findings, etc. In all these cases, MEI offers solutions that accommodate differing encoder intentions. But, in order to avoid too broad a range of solutions, thus making encoding tasks too complex, the group considered a set of guiding principles. Without anticipating final decisions, several conceptually intricate issues were covered, such as the treatment of overlapping hierarchies, the concept of layers, the role of TEI as a model, the synchronization of music with the timeline-element, etc.

As a demonstration of the problems found in some repertoires, S. Morent described several issues found in neume notation and introduced the idea of a project dealing with

the repertoire of St. Gall where the combination of facsimile images and MEI-encodings would be particularly advantageous.

It was through the course of these very detail oriented discussions that the value and long-term need for an international advisory council for MEI became evident to all participants. Although moderating was at times a challenge, having subject specialists interfacing with technicians allowed for immediate interchange about issues and quick decision making.

In the course of these discussions, the group decided to appoint a subset of the Council (E. Selfridge-Field, D. Byrd and J. Veit) to officially document the list of functional requirements. These persons first drafted a working document that exists in the Council's shared workspace. The discussion of this list went on for several months after the meeting and resulted in contributions of further examples by other members of the Council and proposals for the integration of this collection in the MEI documentation during the Detmold workshop.

Also appointed at the Charlottesville meeting was a technical team, consisting of P. Roland, J. Kepper, D. Röwenstrunk, L. Pugin, C. Sapp and R. Viglianti. The roadmap for MEI development by this team was guided by the discussions and decisions made in Charlottesville and a first meeting immediately took place on Saturday after the conference, mainly dealing with the issues surrounding the use of RelaxNG and ODD in the expression of the MEI scheme.

The time between the Charlottesville and the Detmold Workshop included intensive discussions about the most logical structuring of a collection of encoded examples, the search for further typical examples of notational or editorial problems, and the pondering on a future web presence for MEI (leading to a preliminary internal mei-c.org webpage, an MEI-Wiki, and an MEI-discussion list available at mei-l@lists.uni-paderborn.de). But, the most important tasks were the fixing of an MEI schema and the formulation of a tag library with annotations (Roland together with the technical team), the encoding of examples even by non-technical members of the Council (esp. C. Siegert), the work on the "ODD-ification" of MEI (Viglianti), and the participation in conferences where MEI was presented as a new scholarly encoding format. Thus, D. Röwenstrunk presented MEI at the Business Meeting of the TEI SIG Music at the TEI Members Meeting at the University of Michigan in Ann Arbor, November 9-15, 2009, and J. Kepper and C. Siegert included MEI-encoded examples in their lecture about aria arrangements by Joseph Haydn in a conference by the Arbeitsgemeinschaft für Germanistische Edition "Medienwandel – Medienwechsel in der Editions-wissenschaft" in Frankfurt/Main, February 17-20, 2010.

Detmold Workshop

After the extremely productive eight months since Charlottesville, the Advisory Board met again in Detmold, Germany, from March, 15-17, 2010 (agenda in Appendix 4). The fact that all the participants of the first meeting took part at the meeting in the Erich-Thienhaus-Institute of the Detmold Academy for Music is proof of the effective working atmosphere in the group. Four new participants also joined the group. (See Appendix 2.)

By the time of the meeting, the RelaxNG MEI schema was almost complete, a near-final version of the tag library had been circulated, a functional requirements document had been posted for comment and members of the group had been engaged in lively conversation via the MEI listserv. It was clear from the level of activity and productivity that

participants in the Charlottesville workshop were motivated to take responsibility for the further development of MEI. With the Detmold meeting this group was firmly established, and thus the tone of the meeting was quite different from that of the Charlottesville meeting. At the beginning E. Mayhood emphasized that besides a review of the past work, the group had to turn to publication and dissemination planning, funding and organization strategies, plans for MEI training and plans for further technical developments. By the end of the Detmold meeting, the group had made clear work assignments and had laid a foundation for continued development.

Following Mayhood's review, the meeting continued with critical observations about functional requirements (Veit) and a discussion of general political perspectives, mainly concerning the possible addressees of MEI and the problems which result from a very broad catalog of requirements in the metadata and data sections. The group consented to the necessity of a comprehensive list of uses for MEI, "good practice guidelines", and facilitation of data exchange with other formats (in some cases at least in one direction). Relationships to formats such as MusicXML, MuseData, Kern, MARC, METS and TEI were explicitly discussed.

In the afternoon, Roland gave a detailed report on the current state of MEI (schema 1.9.1b), dealt with questions of backward compatibility and the next steps (especially with further feature requests, and the needs for customization and documentation). Viglianti illustrated the way from the former MEI DTD to the ODD literate programming approach used in TEI. Pleading for the last mentioned solution, Viglianti at the end of his remarks formulated a "to-do-list" for the time after this first grant.

A report on the requirements document and possible organization of examples by Selfridge-Field and Veit was accompanied by a comprehensive list of examples compiled by Selfridge-Field and excerpts of a wiki collection of structured notational features by Veit (mainly based on the examples which the group collected since Charlottesville). After discussion, the group decided that a better name for the envisaged concept would be "List of notational features" and that brief examples, rather than complete ones, would prove most effective. In a second phase, the examples should be encoded and published with documentation and didactic hints. D. Byrd who, due to problems with his flight, wasn't able to take part in the main discussion of this topic made his contribution on the second day.

1. Working with MEI

The main topic of the second day was "Working with MEI". There was much astonishment about the number of reports from people already working with MEI: "Haydn by Hand" was one of the most astonishing ones: C. Siegert, a musicologist without ambition in informatics, showed her encoding of variants in the different versions of a single Haydn aria; R. Viglianti demonstrated his experiences with the encoding of Debussy's "Syrinx", including experiments with the creation of a synoptic apparatus; S. Morent reported on the extension of MEI to deal with neume notation; L. Pugin showed the usage of MEI for a Renaissance repertoire and possible rendering techniques using SVG (Scalable Vector Graphics); C. Sapp surprised the audience by his automatic conversions from Humdrum to MEI and showed how he transferred the famous set of 371 Bach Chorales; A. Teich Geertinger illustrated his work with MEI in a catalog of the works of Carl Nielsen; J. Dabbert demonstrated the promising first steps of an MEI-note-editor within the TextGrid-framework; and finally J. Kepper showed the usage of MEI within the Edirom Editor.

2. Dissemination and Teaching

A report prepared by C. Siegert and R. Freedman was a good starting point for the discussions regarding disseminating and teaching MEI. Their reflections on possible forms of MEI usage in the scholarly workaday life, the various communities that the MEI Council has to approach, and especially the possible forms of teaching MEI led to the decision that the most important elements would be a manual (or wiki) with detailed working instructions and the offering of summer-schools or workshops. In a combination of examples, lessons and exercises a sort of "MEI by example" was recommended – this should be based on best practice guidelines, naturally, and take the W3 school tutorials as an example. There was really a bulk of useful proposals from the group and that led to the idea to have a sub-group for teaching and dissemination within the MEI Council (C. Siegert, E. Mayhood, R. Freedman, D. Röwenstrunk, B. Bohl and J. Kepper were appointed as members). This sub-group outlined further goals (see dissemination and teaching plan in Appendix 6).

3. Organizational Aspects

The third day of the workshop was completely devoted to organizational aspects and political perspectives. The discussion, guided by Mayhood and Röwenstrunk, centered on the question how best to establish an organizational structure for MEI to allow it to continue to develop in a community-driven way. Questions of institutional partners, of possible participants and the form of their membership, of licensing and funding strategies were considered. The role of the TEI (Text Encoding Initiative) as a model for organizational structures and a collaboration partner was also discussed. Other topics included the future role of the "MEI Advisory Board", the frequency of meetings of the Board, authorization of changes in the MEI schema, and the intellectual property rights issues surrounding the Council's "ownership" of MEI.

By the end of the Detmold meeting, the group had made clear work assignments and had laid a foundation for continued development. D. Pitti took the task of summarizing the results of the meeting, fixing work assignments, and setting forth the priorities for finishing the grant (Appendix 8).

The end of May 2010 was envisaged as the date for completion of the immediate concerns and the end of July was marked for the handing in of the grant report.

Challenges

Three special challenges resulted from the discussions in Detmold:

1. The communication between technologists and musicologists proved to be one of the central aspects of the effective and successful work of the group. Both sides emphasized the enormous profit of the collective approach of these two workshops. The insight into the foreign subject area calls forth an understanding for the positions and questions of the counterpart which is the precondition for the development of adequate solutions. The question if it would have been better to separate both groups during the workshops in separately discussing working units was explicitly abnegated by the whole group.

2. The relation of text and music and thus the relation of TEI and MEI encoding will be an important question for the future development of MEI. Despite the group's consent on a mostly independent development of the MEI community, it was clear that there should be a very close relationship between MEI and TEI.

3. One of the most complex problems is that of licensing products generated by academia – there are different expectations and different legal prescriptions in different countries. At the moment, there is no consensus on the topic. Advice from other consortia shall be necessary.

Grant Products and Accomplishments

1. Schema

During the Dagstuhl seminar "Knowledge representation for intelligent music processing", held in January 2009, an informal study group was formed to consider expressing the MEI schema in RelaxNG, rather than as a DTD. Even though XML DTD was the most widely deployed means of defining an XML schema at that time, RelaxNG was chosen because it uses XML syntax, defines elements and attributes in the same fashion, supports namespaces, and permits strong data typing. RelaxNG was chosen over the W3C XML Schema language because it provides a concise and easy to understand specification, permits mixing general-purpose and domain-specific collections of data types, and allows precise definition of what elements may be document root elements. It was natural that this change should be part of the grant proposal.

Following the first grant-funded meeting in Charlottesville in July 2009, the technical team began work on the conversion of the MEI DTD to RelaxNG while also incorporating suggestions for improvements gathered at the meeting. Initially, the resulting RNG schema was a single document. However, it became clear that in order to provide more user-centered flexibility, it was necessary to modularize the schema. So, following the initial conversion to RNG, a modularized version was produced. The RNG schema and an XSD translation are now available to the public at <http://mei.svn.sourceforge.net/viewc/mei/trunk/schemata>.

It also became increasingly evident that a literate programming approach was important. Several attempts were made to incorporate structured documentation into the RNG schema. Ultimately, however, due to the strong associations between MEI and TEI, such as common element and attribute names and similar element and attribute class systems, the conclusion was reached that the best method would be to utilize the ODD (One Document Does it all) system developed for the Text Encoding Initiative.

In the ODD model, a markup scheme is defined by a schema, which may subsequently be instantiated using the concrete syntax of an XML DTD, a RelaxNG schema, or a W3C Schema. An ODD schema consists of "references to a number of discrete modules, combined more or less as required. [...] The modules referenced comprise declarations of particular elements and attributes, which can be combined with further declarations given explicitly in the schema for customization purposes."¹

Some work has already been done in this area and the Music in TEI SIG (Special Interest Group) has been awarded funds to hold a meeting of MEI and TEI representatives in August 2009 that will move the process forward.

¹ Burnard, L., Rahtz, S. (2004). RelaxNG with Son of ODD. Presented at Extreme Markup Languages 2004, Montréal, Québec. Available from <http://conferences.idealliance/extreme/html/2004/Burnard01.html>

2. Tag Library

The MEI tag library is a comprehensive list of MEI elements, providing a much needed reference source for encoders. Through the use of natural-language definitions and examples, it assists users of MEI in achieving effective and consistent markup. Despite translating XML and RNG terminology and concepts into more accessible language, the tag library is still a technical document that presupposes readers will possess a minimal understanding of XML and music notation. Novice encoders will need to supplement their use of the tag library by consulting MEI application guidelines, attending introductory MEI workshops and training classes, and referring to other information sources.

As a natural-language translation of the MEI schema, the tag library conveys information about the three principal tasks accomplished by the schema. First, the schema breaks down the content of music notation documents into data fields or categories of information called "elements". All of these elements are named, defined, and described in the MEI Tag Library. Second, the tag library identifies and defines attributes associated with those elements. Attributes are characteristics or properties that further refine the element. Last, and perhaps most importantly, the tag library expresses the schema structure by explaining the relationship between elements, specifying where the elements may be used and describing how they may be modified by attributes. While two of the basic purposes of MEI are to facilitate the searching and display of encoded music notation documents in an electronic environment, nothing in the tag library addresses their specific implementation. Searching and display are entirely dependent on software applications outside the scope of MEI.

Throughout the tag library, coded examples augment the narrative explanations and help illustrate the role, relationship, and usage of elements and attributes. The MEI schema contains only a few required elements, the rest are optional. Therefore, the amount of markup desired will vary from one situation to another depending on intellectual, technical, and financial considerations. Creating encoded music notation documents for inclusion in union databases may also result in tagging requirements that are separate from those dictated by the schema.

The tag library is divided into five sections. It begins with an outline of MEI Design Principles, followed by an overview of the structure of a typical MEI instance and an explanation of terms and conventions used in the tag library. Element definitions comprise the fourth and largest section of the tag library, while an index by element name concludes the documentation.

Suggestions for new elements or revised descriptions may be submitted to the MEI Working Group via the MEI discussion list at mei-l@lists.uni-paderborn.de.

3. Website

The new MEI website is now available at <http://www.music-encoding.org/>. With MEI a newly conceived international effort, it was important to have its own web presence. To support this effort the University of Paderborn agreed to host the website with members of the MEI Council taking responsibility for various aspects of development/editing (see above). The MEI website is now a space for people to learn about MEI and to discover who is involved in its development. Visitors may download the schema, view the annotated complete tag library, and view sample encodings. Furthermore, a tutorial for learning MEI is under construction (a first case based on Mozart's variations on "Ah, vous dirai-je

Maman" is already included), there is a list of MEI-related publications, information about on-going projects of individual MEI community members, about upcoming presentations, workshops and other events dealing with MEI as well as a short history of MEI development (see selected screen shots in Appendix 5) and an outline for a comprehensive structured list of notational and editorial examples.

4. Organizational Structure

Establishing a permanent organizational structure was an integral part of planning for the continued development of MEI. Participants in the Detmold workshop discussed potential forms of organization to support development and the following structure emerged:

MEI Council

The Advisory Board formed with the support of DFG/NEH funds for this workshop year will continue to exist as the MEI Council. Members of the Council correspond to the users of MEI and should be international in scope and represent a wide range of music disciplines, technology, and musicological expertise.

Technical Committee

A subset of the MEI Council will be charged with creating and updating the schema and its documentation.

Council Co-chairs

Two leaders of the MEI Council will be elected; one from North America, one from Europe.

Advisory Board

To ensure strong community connections, representatives of organizations that have an interest in the further development of MEI will be asked to become members of the Advisory Board. This group's duty is to advise and act as consultants.

5. Dissemination and Teaching Plan

As mentioned above, a sub-group dealt with these topics and already contributed to the MEI-website by starting a tutorial and a list of MEI-related events. In addition, a list of scholarly music societies, committees, publishers and other organizations that should be targeted as well as a list of the most important conferences where MEI could be discussed was collected. The first steps toward wider dissemination of MEI have already been taken with J. Kepper's and R. Viglianti's presentation at the Digital Humanities Conference 2010 in London² and with E. Mayhood's talk before the Music Library Association meeting in March 2010. Also, J. Dabbert and J. Veit presented the MEI score editor (MEISE) at the meeting of the TextGrid Council in July 2010 and D. Röwenstrunk contributed an article about the MEI workshops to *Forum Musikbibliothek* 31, 2010/2. The Detmold group will host a summer school (with MEI as a central part) in September 2010. The technical community will be informed about MEI's progress through presentations at the 2010 International Society for Music Information Retrieval (ISMIR) conference; the 2010 Society for Music Theory/American Musicological Society joint meeting; the 2010, 2011, and 2012 TEI Members Meetings; and the 2012 International Musicological Society (IMS) Congress.

² The London presentation resulted in an interview with R. Viglianti. Available at http://www.arts-humanities.net/audio/interview_raffaele_viglianti_dh2010.

Further activities, especially lectures and workshops, will be communicated via the new MEI website (<http://www.music-encoding.org>).

Members of the MEI Council are available to answer requests for MEI-related information via the MEI-L discussion list and a dedicated email address (info@music-encoding.org).

The endeavors of the group for propagating the MEI activities are demonstrated by a series of short reports published in print or on websites (see Appendix 7).

6. Application Development Plans

A basic editor for MEI will be further developed within the German TextGrid project by J. Dabbert, C. Sapp will contribute conversion tools from MuseData to MEI, and P. Roland will improve the conversion from and to MusicXML. Additional applications are expected to be generated by other projects utilizing MEI, such as the McGill project discussed below.

Audiences and Evaluation

MEI has a very large potential audience comprised of scholars, musicologists, music historians, librarians, publishers, composers, performers, high school teachers, university students as well as computer scientists and engineers. The MEI Council, which has members from Denmark, Great Britain, Germany, Switzerland, and the U.S., has striven to address many of the needs of this audience. It remains a primary task of the Council, however, to include new perspectives by integrating new members in the years to come. We are encouraged by the first echoes of the announcements of the publication of MEI 2015-05 indicating that there is vital interest in the development of MEI beyond the present members of the Council.

A comprehensive evaluation of the project is not really possible at this time because we are still in the initial stages of MEI's development. However, the first reactions at scholarly conferences have been very positive. Presentations of variant encoding capabilities and rendering possibilities in Frankfurt and Göttingen in February and July 2010 found enthusiastic approval. In addition, presentations at the Digital Humanities conference in London in July introduced MEI to a wider audience and produced positive feedback. A McGill University project, starting this summer and funded by the Canadian Social Sciences & Humanities Research Council, will output MEI from the OMR (optical music recognition) systems they will be using to recognize and encode chant notation from the *Liber Usualis*. In addition, the joint U.S./French Du Chemin project, an effort to create digital editions of 16th century music, is interested in employing MEI as the backbone of its encoding efforts. Finally, individual scholars not already associated with MEI have volunteered their services to continue its development. It appears that MEI is being favorably evaluated by the user community to which it was addressed.

Continuation and long-term impact of the Project

It was clear from the beginning that further funding would be necessary to continue the project. The MEI community is still too small to establish a structure of internal financial support comparable to the TEI, and a fixing of financial contributions for membership in this early phase of work would be counter-productive for the dissemination of MEI. Thus, the members of the MEI Council strongly supported the new *DFG-NEH proposal Digital Music Notation Data Model and Prototype Delivery System – A DFG/NEH Bilateral Digital Humanities Program: Enriching Digital Collections Proposal* in order to produce an MEI demonstration project and to further engage in dissemination efforts that will establish MEI

as the predominant academic encoding standard for music notation. This proposal for a three years funding was submitted in the time between the two workshops in October 2009.

Thanks to the activities of R. Vigiante, a further special promotion of the project was made possible by a small grant of the TEI Consortium for the SIG Music within the TEI. As a consequence, there will be a workshop dealing with the "ODD-ification" of MEI in August 2010 in Detmold/Paderborn with contributions by the MEI technical team and Sebastian Rahtz from the TEI.

Several projects plan to integrate MEI in their work and this will certainly result in special new requirements. The linking of music with text (e.g. in the OPERA project Bayreuth), the integration of non-common music notation (e.g. in a planned project concerning the St. Gall repertoire), and the topic of genetic editions (e. g. in a planned project by the Beethoven-house with Edirom) shall bring new challenges for the MEI encoding. These new challenges, however, will propel to the development of MEI into a format that is able to cover a wide range of music notation and thus to its acceptance as a new standard encoding format.

Appendices

Participants in the Charlottesville workshop

Gabriele Buschmeier - Coordinator of nearly 20 long-term scholarly musicological editions at the Academy of Sciences and Literature at Mainz, Germany: Bach, Brahms, Händel, Haydn, Schönberg, Schubert, Schumann, Wagner, Weber, etc., and the Gluck edition

Donald Byrd - Associate Professor of Informatics at Indiana University, specialist in music notation problems in general, PhD on Music notation by computer 1984, co-author of the so-called Byrd-Isaacson-list: "A Music Representation Requirement Specification for Academia"

J. Stephen Downie - Associate Professor at the Graduate School of Library and Information Science, University of Illinois at Urbana-Champaign, specialist in the design and evaluation of Music Information Retrieval Systems and web-based technologies

Megan England – University of Virginia, composition graduate student with advanced knowledge of music notation systems and a specialization in twentieth century notation, technical assistant and recorded of the meetings

Richard Freedman - Professor of Music at Haverford College, PA, specialist in Mediaeval and Renaissance music and working on the digital project "Ricercaar"

Johannes Kepper - Member of the DFG-sponsored project "Development of tools for scholarly digital music editions: Ediorom" at Detmold/Paderborn, PhD "The Music Edition in the Context of New Media", co-PI of this DFG/NEH-proposal

Erin Mayhood - Head of the Music Library, University of Virginia, specialist in user requirements and usability testing and co-creator of Blacklight music, a specialized search interface for music researchers, co-PI of this DFG/NEH-proposal

Stefan Morent - Professor at the Department of Musicology, University of Tübingen, head of the DFG-funded projects TüBingen and DiMusEd as well as director of the ensemble Ordo Virtutum

Daniel Pitti - Associate Director of the Institute for Advanced Technology in the Humanities at the University of Virginia, member of the TEI Consortium Board, architect of EAD (Encoded Archival Description)

Laurent Pugin - Co-director of the Swiss RISM Project concerned with digital infrastructure and leading developer of Aruspix, PhD on Early Music Editing and Optical Music Recognition at Geneva University

Perry Roland - Member of the Digital Library Research & Development group at Alderman Library, University of Virginia, metadata specialist and creator of the MEI encoding format, co-PI of this DFG/NEH-proposal

Daniel Röwenstrunk - Computer scientist in the DFG-funded project "Development of tools for scholarly digital music editions: Edirom" and consultant for the Detmold/Paderborn part of the TextGrid project

Craig Sapp - Member of the Center for Computer Research in Music and Acoustics at Center for Computer-Assisted Research in the Humanities at Stanford University, PhD on "Computer-Based Music Theory and Acoustics" and creator/maintainer of the Humdrum **kern library of virtual music scores

Eleanor Selfridge-Field - Consulting Professor for Music and Symbolic Systems at the Center for Computer-Assisted Research in the Humanities at Stanford University; for several decades involved in the development of open-source repositories, music representation, data interchange and musical data-query methods, author of "Beyond MIDI" and co-editor of "Computing in Musicology"

Christine Siegert - Editor and musicologist, member of the editorial staff of the hybrid edition "Opera – Spectrum of European Music Theatre in Selected Editions", PhD on Italian opera in the late 18th century, preparing a digital edition of aria arrangements by Joseph Haydn

Joachim Veit - Managing editor of the Carl-Maria-von-Weber-Complete-Edition at the Musicological Seminar Detmold/Paderborn, head of the DFG-sponsored Edirom project and the Detmold/Paderborn part of the TextGrid project, co-PI of this DFG/NEH-proposal

Raffaele Viglianti - PhD Candidate and Research Assistant at the Centre for Computing in the Humanities at King's College, London, co-convener of the SIG Music within the TEI, preparing a PhD on problems of a digital edition of Weber's "Freischütz"

Participants in the Detmold workshop

All participants in the Charlottesville meeting also attended the Detmold workshop. The following persons also took part in the Detmold meeting:

Bernhard Appel - Professor, Head of the Beethoven Archive and the publishing department of the Beethoven-house Bonn, formerly member of the editorial staff of the Robert Schumann Edition Düsseldorf; published many fundamental articles about editorial theory, especially genetic editions

Axel Teich Geertinger – Staff member of Danish Centre for Music Publication at The Royal Library, Copenhagen; PhD on the Italian opera sinfonia 1680-1710; editor of the conference proceedings "Digital Editions of Music: Perspectives for Editors and Users"

Julian Dabbert - Computer scientist, working in the Detmold/Paderborn section of the TextGrid project, developing an editor for MEI

Benjamin Bohl - Member of the Edirom project Detmold/Paderborn, BA in Recording Arts at Munich, MA from Würzburg University with a digital version of Francesco Geminiani's "Guida Armonica"

Agenda of the Charlottesville workshop

UNIVERSITY OF VIRGINIA LIBRARY
Charlottesville Workshop/Digital Music Notation Data Model

Tuesday, July 28 2009

Travel Participants arrive in Charlottesville at various times

Lodging Cavalier Inn. 105 N. Emmet Street. Charlottesville, VA 22903
(888)882-2129

Wednesday, July 29 2009

- 8:15 a.m. Meet Erin Mayhood in lobby of hotel for walk to Alderman Library
- 8:30 a.m. – 9:00 a.m. Welcome coffee - The Institute for Advanced Technology in the Humanities (IATH), third floor of the west wing of Alderman Library
- 9:00 a.m. – 9:15 a.m. Welcome address (Karin Wittenborg, University Librarian, University of Virginia)
- 9:15 a.m. – 12:30 p.m. 1. Research project design and collaboration (Daniel Pitti, Co-Director, Institute for Advanced Technology in the Humanities, University of Virginia)
2. Why XML: How it works, how others are using it (Daniel Pitti)
3. Short summary of the grant obligations and proposal promises (Erin Mayhood and Joachim Veit)
- 12:30 p.m. – 2:00 p.m. Lunch (provided)
- 2:00 p.m. – 5:00 p.m. A systematic approach from the perspective of Musicology (Erin Mayhood and Johannes Kepper)
1. Introduction: Terminology/Domains (Johannes Kepper)
2. Example Organization/Feature Separation (Joachim Veit)
3. Discussion of Examples (All)
- 7:30 p.m. - 9:00 p.m. Group dinner at Aromas Café (provided)
-

Thursday, July 30 2009

- 8:30 a.m. - 9:00 a.m. Morning coffee (IATH)
- 9:00 a.m.- 12:30 a.m. 1. High Level Overview of MEI (Perry Roland) 1 hour
2. Specific, technical aspects of MEI (Perry Roland, Daniel R wenstrunk and Johannes Kepper) – general relationship between TEI and MEI (content issues – music combined with text), documentation (needs for, strategy) 1 hour
3. MEI Tools (Daniel R wenstrunk) 1.5 hours
- 12:30 p.m. – 2:00 p.m. Lunch (provided)

UNIVERSITY OF VIRGINIA LIBRARY
Charlottesville Workshop/Digital Music Notation Data Model

2:00 p.m. – 5:00 p.m.	1. A systematic approach from the perspective of Musicology continued... (Erin Mayhood and Johannes Kepper)
Friday, July 31 2009	
8:30 a.m. - 9:00 a.m.	Morning coffee (IATH)
9:00 a.m. - 12:30 a.m.	Community-Building / Political Aspects (Daniel Pitti). Points for discussion: <ul style="list-style-type: none">-What is the relationship of MEI to other encoding formats?-How should we promote MEI?-How could we establish a MEI community?-Should we have a public MEI-List? MEI-Wiki? MEI-website? MEI-council?-How can we build a larger corpus of examples/works encoded with MEI?-Relationship with TEI.
12:30 p.m. – 2:00 p.m.	Lunch (provided)
2:00 p.m. – 5:00 p.m.	1. Progress Review (Daniel Pitti) 2. Next Steps (Erin Mayhood and Joachim Veit)

Agenda of the Detmold workshop

Music Encoding Initiative | Workshop 2010 | March 15 – 17 | Erich-Thienhaus-Institute | Detmold

Monday, March 15 2010		Tuesday, March 16 2010		Wednesday, March 17 2010	
08:30	Morning coffee	08:30	Morning coffee	08:30	Morning coffee
09:00	Welcome addresses <ul style="list-style-type: none"> • Prof. Christian Martin Vogel, Rektor of the Hochschule für Musik, Detmold • Prof. Dr. Rebecca Grotjahn, Head of the Musicological Institute 	09:00	Reports on Working with MEI (Roland, Kepper) <ul style="list-style-type: none"> • Dabbert: TextGrid Note-Editor • Siegert: Haydn by hand • Sapp: Automatic conversions • Morent: Medieval MEI • Teich Geertinger: Cataloguing with MEI • Pugin: MEI for a Renaissance repertoire • Vigilanti: Experiences from Syrinx • Kepper: MEI in the Edrom Editor 	09:00	Political Perspectives – MEI Organisation (Mayhood, Röwenstrunk) <ul style="list-style-type: none"> • forms of organisation for MEI • Institutional partners of MEI (University of Virginia Library, Universität Paderborn, CCARH, Mainz Academy, ...?) • Funding strategy for MEI • Promoting MEI (conferences, website, flyer...) Summary (Pitti) <ul style="list-style-type: none"> • Progress Review • Next Steps
09:30	Introduction (Mayhood, Veit) <ul style="list-style-type: none"> • Overview of the grant obligations and proposal promises: What happened in Charlottesville, what was promised and achieved since then? What is planned for this meeting? (Mayhood, Veit) Political Perspectives – MEI Community (Pitti, Kepper) <ul style="list-style-type: none"> • What is the target group of MEI? What are their needs? • What is the relation between MEI and other formats (MusicXML, Humdrum, TEI...)? 	12:30	Lunch	12:30	Lunch
12:30	Lunch	14:00	Disseminating / Teaching MEI (Freedman, Siegert) <ul style="list-style-type: none"> • What is the best way to explain and document MEI (based on selected examples)? • What kind of training and workshop materials should be developed? 	14:00	Technical Perspective (Roland, Kepper) <ul style="list-style-type: none"> • Technical implementation of website, documentation, schema dissemination etc. • How can we support software developers (webservices...)? • Interchangeability with other formats
14:00	Reports (Röwenstrunk) <ul style="list-style-type: none"> • Presentation of the current state of MEI (schema, module structure, sample encodings; Roland, Kepper) • Report on the Requirements Document (Selfridge-Field, Byrd, Veit) • Report on the ODDification of MEI (Viglianti) 	17:00	Demonstration of WFS (Sound Field Synthesis, till 18:00)	17:00	
17:00	Demonstration of WFS (Sound Field Synthesis, till 18:00)	19:30	Concert <ul style="list-style-type: none"> • Moritz Moszkowski Klavierkonzert E-Dur op. 59 • Peter I. Tschaikowskij Sinfonie Nr. 3 D-Dur op. 29 "Polnische" Nordwestdeutsche Philharmonie, Konzerthaus HfM Detmold		
19:30	Group dinner at Strate's Brauhaus (provided)				

Screenshots from the website: <http://www.music-encoding.org>

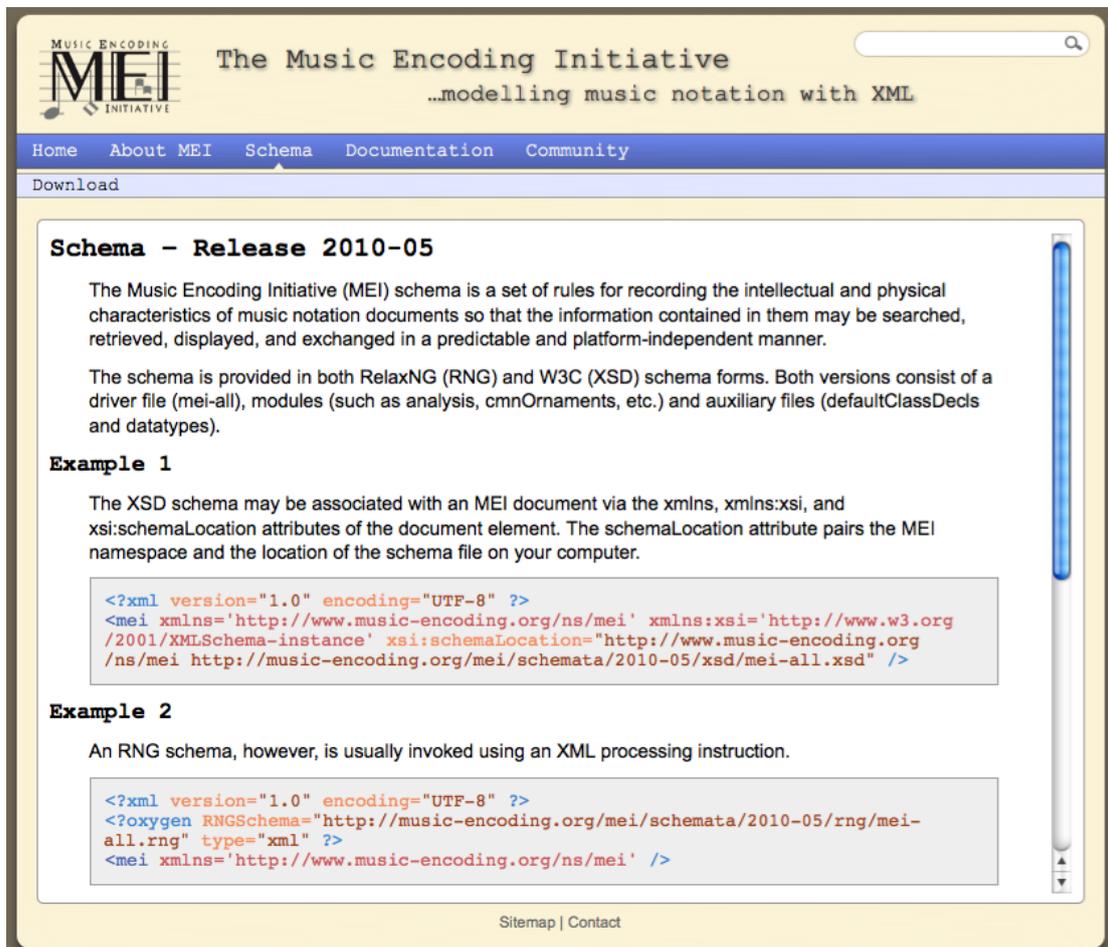


Fig. 5.1: Schema release 2010-05 at the MEI website

The screenshot shows the Music Encoding Initiative (MEI) website. At the top, the logo for MEI is on the left, and the text "The Music Encoding Initiative" and "...modelling music notation with XML" is on the right. Below this is a navigation bar with links: Home, About MEI, Schema, Documentation, and Community. Underneath, there are links for Tutorial and Tag Library. The main content area is titled "Tag Library" and features a search box and a list of tags. The tag "<change>" is selected and highlighted in blue. To the right of the list, the details for the "<change> change" element are displayed. This includes a "Description:" section with a paragraph of text, a "May contain:" section listing "<changedesc>, <date>, <respstmt>", a "May occur within:" section listing "<revisiondesc>", and an "Attributes:" section listing "@analog, optional, CDATA". At the bottom of the page, there are links for "Sitemap" and "Contact".

MUSIC ENCODING INITIATIVE
MEI
 The Music Encoding Initiative
 ...modelling music notation with XML

Home About MEI Schema Documentation Community

Tutorial | Tag Library

Tag Library

- <chan>
- <change>**
- <changedesc>
- <chanpr>
- <choice>
- <chord>
- <chordef>
- <chordmember>
- <chordtable>
- <classcode>
- <classification>
- <clef>
- <clefchange>
- <condition>
- <corpname>
- <corr>
- <correction>
- <creation>
- <cue>
- <curve>
- <custos>
- <damage>
- <date>
-

<change> change

Description:

Individual change within the revision description. Additions, deletions, and significant recoding should be noted, but not correction of minor typographical errors. It is recommended that revisions should be entered in reverse chronological order, with the most recent <change> first. The resp attribute contains a pointer to an element containing info about the person/entity responsible for change. The edition element can be used to designate an MEI encoding that has been so substantively changed that it constitutes a new version that supersedes earlier versions. This element is modelled on an element in Encoded Archival Description (EAD).

May contain:

[<changedesc>](#), [<date>](#), [<respstmt>](#)

May occur within:

[<revisiondesc>](#)

Attributes:

@analog, optional, CDATA
 contains a reference to a field or element in another descriptive

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Fig. 5.2: Detail from the Tag Library: description of the element <change>

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Tag Library

used to record the onset time in pulses per quarter note (ppq, MusicXML divisions, or MIDI clicks) since the start of the file.

@xml:id, optional, xs:ID

regularizes the naming of an element and thus facilitates building links between it and other resources. Each id attribute within a document must have a unique value.

Module:
cmn

Illustration:

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Fig. 5.3: Detail from the Tag Library: musical illustrations within the annotations to the element `<beam>`

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Tutorial Introduction Open Table of Contents

A MEI Tutorial

based on W. A. Mozart's Variations on "Ah, vous dirai-je Maman"



In this simple tutorial you will learn how to manage the first steps encoding music in MEI. As an example we use Mozart's variations of the piano piece "Ah, vous dirai-je Maman", which will give you a good insight into the structure and thinking in MEI. Every example is illustrated by the corresponding excerpt from the Neue Mozart Ausgabe IX/26 (the whole piece is accessible at www.mozarteum.at).

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Fig. 5.4: Beginning of the first tutorial based on Mozart's variations

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Tutorial
Step 8: multiple staves

Open Table of Contents

Step 8: multiple staves

Of course, you may add the second staff for the left hand, as well. You just have to add a second staff in the measure.

```

<measure n="7" >
  <staff n="1" >
    <layer >
      <note pname="d" oct="5" dur="4" />
      <beam >
        <note pname="d" oct="5" dur="8" dots="1" />
        <note pname="e" oct="5" dur="16" />
      </beam>
    </layer>
  </staff>
  <staff n="2" >
    <layer >
      <note pname="f" oct="3" dur="4" />
      <note pname="g" oct="3" dur="4" />
    </layer>
  </staff>
</measure>

```

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Fig. 5.5: Detail from the tutorial: description of encoding of multiple staves

MUSIC ENCODING INITIATIVE **MEI** The Music Encoding Initiative
...modelling music notation with XML

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Projects | Events | Support

Events

Release of MEI 2010-05
31st May 2010

The MEI Council is pleased to announce the first collaboratively-designed method for encoding the intellectual and physical characteristics of music notation documents and their scholarly editorial apparatus. MEI has the ability to manage complex source situations and will dramatically improve the search, retrieval and display of notated music online, benefiting music scholars and performers. Because of MEI's software independence, the data format defined by the schema also serves an archival function. Read the full [press release](#).

Digital Humanities Conference
7th – 10th July 2010, King's College London

During **DH2010** MEI will be represented twice: Raffaele Vigiante will present a poster about "Critical Editing of Music in the Digital Medium: an Experiment in MEI." This will be a demonstration of the experience he made with MEI during his dissertation titled "Digital Editing of Music: A Prototype for Syrnix (La Flûte de Pan) by Claude Debussy", finished 2009.

Additionally, Raffaele Vigiante and Johannes Kepper will present a paper called "A Data Model for Digital Musicology and its Current State – The Music Encoding Initiative", which will introduce the first official release of MEI to a wider audience.

Workshop on ODD
25th - 27th August 2010, Musikwissenschaftliches Seminar Detmold / Paderborn

The **TEI Music SIG** has been granted by the TEI to explore the possibility of expressing MEI in **ODD**. This will allow a closer connection of these two schemes and improve the situation for scholars having to encode mixed content. In late August, Johannes Kepper, Sebastian Rahtz, Daniel Rösenstrunk, Perry Roland and Raffaele Vigiante will meet in Detmold to start working on this conversion.

Annual Meeting of the Society for Music Theory
4th - 7th November 2010, Indianapolis, Indiana

Erin Mayhoo and Perry Roland will present "Toward Electronic Music Editions: The Music Encoding Initiative" at the **2010 annual meeting** of the Society for Music Theory.

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Fig. 5.6: Community section of the website with announcements of and reports on special events

Dissemination and Teaching Plan

Goal

The MEI dissemination effort aims to introduce MEI to potential users and present the benefits/potential of MEI to inspire usage, further development, and future projects. The goal of the dissemination plan is utilization.

Users

One of the most effective ways to increase utilization and to improve the quality and relevance of MEI development is to involve probable users in the planning and implementation of MEI. For this reason, the MEI Council should maintain the goal of broad international, scholarly and technical representation.

The Council has identified numerous populations of scholars that will benefit from the use of MEI including: music theorists and analysts, performance analysts (for numerical or structural analysis), music historians (genesis of compositions), music editors (handling of versions, variants, genetic aspects, annotations), music librarians (metadata, identification, searching, storage of variants, text, annotations), psychologists (perception and cognition, control tests), composers (in so far as notated music is concerned), students of notational issues, instructors (pedagogical applications), performers (performing editions), ethnomusicologists, computer scientists and engineers.

In response to the needs of these users, the Council has devised the following plan for dissemination:

Creation of a Teaching/Dissemination Subgroup of the MEI Council

A subgroup of the MEI Council has been charged with creating and implementing a teaching and dissemination plan. The group currently has the following membership:

Richard Freedman
Christine Siegert
Daniel Röwenstrunk
Benjamin Bohl
Johannes Kepper
Erin Mayhood

Tag Library (completed)

As reported in the Grant Products and Accomplishments section of the Final Performance Report, the MEI Tag Library is a comprehensive list of MEI elements, providing a much needed reference source for encoders.

Encoded Examples (completed)

A test collection of music notation examples illustrating suggested usage of MEI are available on the MEI website (<http://www.music-encoding.org>).

Communication with Communities

Various scholarly communities will benefit from learning about MEI and the potential it holds for their discipline. As humanists, music scholars report their preferred ways of "keeping current" are print based or interaction with colleagues via conferences or

personal interactions¹. The MEI community will build upon already established professional relationships by presenting and teaching MEI at recognized professional organizations and meetings. Communication methods will include poster sessions, formal presentations and workshops. Target scholarly organizations include:

- American Musicological Society
- Society for Music Theory
- Society for Ethnomusicology
- Music Library Association
- International Association of Music Libraries
- International Musicological Society
- International Society for Music Information Retrieval
- Digital Humanities Conference

In addition to organizations, academic institutions with institutes offering support for digital humanities scholars (such as the Institute for Advanced Technology in the Humanities, University of Virginia, and the Maryland Institute for Technology in the Humanities) should be aware of the possibilities made available by MEI in order to provide the full scope of possibilities and technology support to their scholars.

Publishing and editing groups will have a strong interest and need for MEI. The MEI Council has already reached out successfully to two organizations: the Danish Centre for Music Publication, Royal Library, Copenhagen and the Beethoven-Haus. Activities of the Danish Centre for Music Publication are outlined in the attached white paper *Cataloguing with MEI* by Axel Teich Geertinger. American publishers/organizations such as A-R Editions in Madison, WI and the American Folklife Center at the Library of Congress should also be introduced to MEI. The Council will work with professional organizations and libraries to identify more potential partners.

Training and Workshop Materials

Because of the complexities involved in encoding music, communication strategies should also include teaching opportunities to both technical and non-technical scholars.

Available from the MEI website will be a number of essays or position papers (such as the white papers attached to this report) summarizing projects and best practices and a wiki with detailed working instructions for MEI will also be developed. Courses offering instruction in MEI encoding will be developed and offered in affiliation with universities (as courses), workshops for librarians and scholars at professional meetings and as visiting lectures.

Additional tutorials will be openly available from the MEI website. Currently a tutorial based on W. A. Mozart's Variations on "Ah, vous dirai-je Maman" offers instruction on how to manage the first steps encoding music in MEI (<http://www.music-encoding.org/documentation/tutorial>).

¹ Christine D. Brown, "Straddling the humanities and social sciences: the research process of music scholars," *Library & Information Science Research* 24, no. 1 (2002): 73-94.

An additional, more in-depth tutorial will be developed using Bach chorales as the subject matter. This tutorial will be interactive and be organized by layers of musical information (pitch, rhythm, dynamics, and metadata). Interactivity is essential and the tutorial should offer a simple MEI renderer that establishes cause and effect for learners. The Humdrum online renderer available at: <http://kern.humdrum.org/cgi-bin/kern/kseditor> is a model for this approach.

Examples of first dissemination efforts

Daniel Röwenstrunk, "Digital Music Notation Data Model and Prototype Delivery System – Ein deutsch-amerikanisches Projekt zur Förderung eines wissenschaftlichen Codierungsformats für Musiknotation", in: *Forum Musikbibliothek* 31 (2010), p. 134-138

Report on both workshops on the website of the Academy of Sciences and Literature at Mainz, <http://www.adwmainz.de/index.php?id=935>

Report on the Charlottesville workshop in the *paderborner universitäts-zeitung puz*, <http://www.uni-paderborn.de/universitaet/hochschulmarketing/puz/>, p. 85

Report on the Detmold workshop in the *paderborner universitäts-zeitung puz* 1/2010: <http://www.uni-paderborn.de/fileadmin/hochschulmarketing/puz/puz2010.1.pdf>, p. 94

Report on the Charlottesville workshop in the TextGrid newsletter no. 6 (2009): <http://www.textgrid.de/newsletter/news-06.html>. and on the Detmold workshop in the TextGrid newsletter no. 8 (2010): <http://www.textgrid.de/newsletter/textgrid-newsletter-08.html#c1383>

Interview with Raffaele Vigiante on the Digital Humanities Conference 2010 in London: http://www.arts-humanities.net/audio/interview_raffaele_vigliante_dh2010

Decisions from Detmold meeting

- Completion of MEI schema and addition of changes: Perry Roland
- Tag Library: Erin Mayhood (checked by Perry Roland)
- Website Server: Daniel Röwenstrunk
- Website Content Review & Appropriation: Megan England, Raffale Viglianti, Johannes Kepper
- Website Coordination: Benjamin Bohl
- Website Design (in a preferably simple form): the above-named web team
- Grant Report Writing: Erin Mayhood and Joachim Veit
- "Working with MEI" Reports: Christine Siegert, Julian Dabbert, Axel Teich Geertinger, Johannes Kepper, Stephan Morent, Laurent Pugin, Craig Sapp, Raffaele Viglianti
- List of Notational Features: Eleanor Selfridge-Field, Don Byrd, Joachim Veit (in the editorial field assisted by B. Appel)
- License Recommendations: Stephen Downie
- New (smaller) Advisory Board: Gabriele Buschmeier, Daniel Pitti (others to be decided later)
- Former Advisory Board renamed as Working Group (later amended to MEI Council)

Considering the encouraging engagement of the members of the MEI group, Pitti finally marked the priorities for the finishing phase of the grant:

- Immediate concerns: completion of the schema – Tag Library – Website – collection of encoded examples – decision about the name for MEI website
- High priority concerns: decision about the final organizational structure of MEI – reports from the "Working with MEI" group – license decision – grant report

Cataloguing with MEI

Axel Teich Geertinger, Ph.D.

Researcher at the Danish Centre for Music Publication, Royal Library, Copenhagen

Having as one of its aims the development of alternative forms for the presentation and dissemination of scholarly editions of music, the Danish Centre for Music Publication¹ (DCM) was searching for a data format suitable for the preparation, flexible presentation and long-term storage of its future editions. The Music Encoding Initiative (MEI) seemed to be by far the most promising approach for this purpose, providing not only the desired flexibility and accessibility inherent to XML in general, but also explicitly addressing the needs of scholarly editions of music such as variant encoding, annotation, and detailed source description.

On this background, DCM decided to build an infrastructure based on an MEI file repository. With this repository and a suitable set of authoring and editing tools, DCM is putting an effort into moving away from the use of software specific file formats to produce presentation oriented output and towards the general separation of data storage from the presentation of data.

DCM not only produces editions of musical and music-related works, but also a variety of resources for scholars such as work lists and catalogues to specific repertoires. All of these resources may be conveniently encoded using MEI. Ideally, every work or source presented by DCM regardless of context will have a unique MEI entry, a subset of which is then extracted depending on context.

As tools for easy music entry and editing in MEI are still under development, it was decided to focus on building the basic repository infrastructure and encoding of metadata in the first phases of the project. Thus, DCM's first MEI-based project is not the edition of a musical work, but a thematic index of the works of Carl Nielsen. A complete, thematic index to Nielsen's works (CNW) has long been wanted, and some of the grants providing DCM's financial basis are given for this specific purpose. This project therefore had high priority from the very beginning of DCM's activities.

To enable convenient methods for entering CNW data also for editorial staff not familiar with the concept of XML, a metadata editor will be developed, which will be used to enter the non-musical information and store it in MEI format.

Like most traditional, printed thematic indexes, for each work the CNW will contain

- The CNW number assigned

¹ The Danish Centre for Music Publication (www.kb.dk/en/kb/nb/mta/dcm) was founded in August 2009 as a research unit at the Royal Library in Copenhagen in order to "maintain and develop competences" gained from the edition of the complete works of Carl Nielsen. The Carl Nielsen Edition started in 1994 and was completed earlier in 2009.

This paper was written with the joint support of the National Endowment for the Humanities and the Deutsche Forschungsgemeinschaft, grant no. HW5000109 (NEH) and 144 USA 122/08/09 (DFG). Any views, findings, conclusions or recommendations expressed in this publication do not necessarily reflect those of the National Endowment for the Humanities or the Deutsche Forschungsgemeinschaft.

- Title(s) in English and original language
- A summary of the compositional history and circumstances
- A list of sources
- Text author, text source, text incipit and dedicatee where applicable
- First performance and other significant performances
- A concordance to existing (incomplete) indexes
- A bibliography
- An outline of the musical contents, including
 - Main key
 - Scoring
 - Movement titles
 - Music incipit(s)

The music incipits will probably at first be included as graphics imported from existing music notation software (Sibelius) or, as soon as the necessary tools are available, encoded using a graphic MEI editor and displayed in web contexts using an MEI rendering engine.

The term “metadata” is not entirely unambiguous. Whether information is to be regarded as data or metadata depends not only on the relation between the information and its sources, but also on the context in which it is used: For instance, the works’ metadata and some of its data constitute the actual data (i.e. the contents) of a catalogue. And on the other hand, contextualising remarks and the critical apparatus form an integral part of a scholarly edition and would be more correctly classified as data rather than metadata, though not being part of the musical substance of the work published. With these uncertainties in mind, no effort was made to restrict what is usually classified as metadata to only the `<meihead>` element (i.e. the header) of MEI, not least because also the `<music>` element may contain not only the actual music data (in the `<body>` element), but also front and back matter, which in some contexts may be regarded as metadata, and as data in others.² Instead, information is rather pragmatically encoded where appropriate elements are available, whether in the header, the front matter or even the music sections of the schema.

A database serves as a file table for the XML file repository, while the metadata editor itself is implemented in XHTML using XForms to read in the MEI XML model, populate it, add or modify elements and attributes, and store it.

² It may be noted that the structure of MEI with the `<music>` element being parent to the `<front>`, `<body>` and `<back>` elements, indicates that MEI acknowledges the fact that front and back matter may be part of the work published.

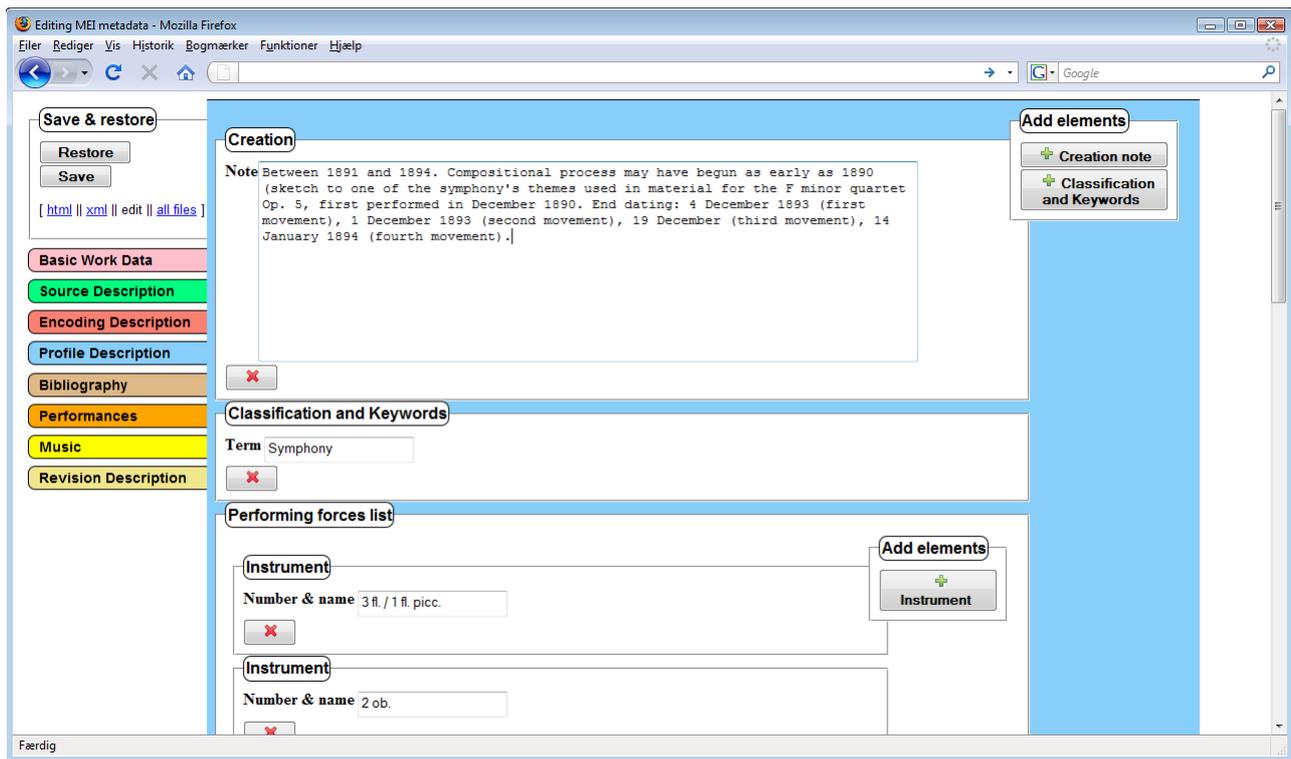


Fig. 9.1: Screenshot from the metadata editor

No final decision has yet been made on whether the CNW will be available online only or also in print. Since the XML-based approach allows the transferring of data into virtually any format, such decisions need not be made until the output is needed. The separation of the data entry from the presentational process thus also has organisational implications: The process of establishing the basic data (content) already results in a valuable source, from which multiple future outputs may be derived at any later stage.

Haydn by Hand

Christine Siegert

With the partial encoding of two aria arrangements made by the *maestro di cappella* Joseph Haydn for the Esterházy court, I have tried to find out more about the possibilities that MEI offers for scholarly music editions, since editors have been defined as one of the target groups for MEI. Both examples especially focus on variants. These encodings are based on the idea that all variants and modifications in the compositional process are equally important and have to be treated as such.

“Non per parlar d’amore”¹

The first example, the aria “Non per parlar d’amore”, is taken from Niccolò Piccinni’s opera *L’avaro*. The aria itself is by Antonio Salieri who inserted it into Piccinni’s opera for a Vienna performance. Haydn bought a Viennese copy containing this insertion, and then modified the aria for Eszterház. At the end of the first part, Haydn substituted seven new measures (22–28) for eight original ones (21a–h). After that, he replaced one more measure (62a with 63). In these cases, a whole measure and several measures, respectively, are contained in the readings of one `<app>` element. In measure 18 and 19 we find two minor changes in the first violin: instead of the two dotted quarter notes g” and f”, Haydn wrote broken triads. It is very likely that he changed the unison vocal part in the same way, and that, moreover, the modification of the violin was the result of a necessary change in the vocal line. But no evidence for this supposition can be found in the score (the part book that should have contained the modification has not survived). Therefore the “Haydn” readings in the vocal part are characterized as supplied.

To maintain the idea of equal importance, in my encoding (that is limited to the first part of the aria), I have used only readings to mark up the variants. There is no hierarchy; the `<lem>` element, which would indicate a predominant status in an edition compared with a `<rdg>` element, is not used.

“Vorrei punirti, indegno”²

The encoding of the second example, Haydn’s arrangement of the aria “Vorrei punirti, indegno” from Pasquale Anfossi’s opera *La finta giardiniera*, follows the same principles. However, it is more complicated. In the opera material of the Esterházy castle, the aria is represented in five versions. The original version (no. 1) is part of the Italian score of

¹ The encoding of this arrangement was first presented in a paper read at the Sixth Conference in Musical Philology *Musical Philology Today – Historical Heritage and New Perspectives*, Cremona, 25–27 November 2009: Christine Siegert, Movimento testuale ed edizione. Il caso dell’aria “Non per parlar d’amore”.

² The encoding of this arrangement was first presented in a paper read at the International Conference of the Arbeitsgemeinschaft für germanistische Edition *Medienwandel / Medienwechsel in der Editionswissenschaft*, Frankfurt, 17–20 February 2010: Johannes Kepper / Christine Siegert, Oper multimedial. Zur “Edirom”-Ausgabe von Haydns Arienbearbeitungen.

This paper was written with the joint support of the National Endowment for the Humanities and the Deutsche Forschungsgemeinschaft, grant no. HW5000109 (NEH) and 144 USA 122/08/09 (DFG). Any views, findings, conclusions or recommendations expressed in this publication do not necessarily reflect those of the National Endowment for the Humanities or the Deutsche Forschungsgemeinschaft.

Anfossi's opera, which was bought for Eszterház (1780). Haydn arranged this aria by adding horns and oboes and with some further changes (version no. 2). After adding the wind instruments, he cut off four bars, so we can define an intermediary stadium as well (version no. 3). Three years later, the aria came a second time to the Esterházy court, as an insertion in a Viennese score of Giuseppe Sarti's *Fra i due litiganti il terzo gode*. But this insertion aria had been arranged yet another time – probably in Vienna: for instance, it had been significantly shortened (version no. 4). Haydn arranged the aria again (version no. 5), this time without adding oboes and horns. Instead, for this version a bassoon part has survived. In the printed score of the Haydn complete works (*Joseph Haydn Werke*) the two arrangements will be printed in different volumes (vol. XXVI/3 and 4, ed. Christine Siegert). In my MEI encoding, I of course wanted to combine all five versions. Therefore, Johannes Kepper (*Edirom* project Detmold-Paderborn) converted my printer's copy of the 1780 arrangement (set with a music notation program) via MusicXML to MEI, and I had to revise it and add the 1783 readings.

For basic information contained in the scores, like the pitch or the duration of the notes, the conversion worked very well. Beamed notes did not cause many problems either. The conversion of accidentals might be improved, however: accidentals were all represented as gestural ones (i.e. sharps and flats); naturals were completely missing. Slurs were defined twice: with a timestamp as well as with a start and an end ID. Considering the IDs, I would prefer a semantic numbering, because this seems to me much more convenient to work with. I have distinguished notes, rests, chords and measures: for instance n36-6-7 means measure 36, staff 6 (the first violin), note 7. Johannes Kepper suggested that perhaps a simple "e" for "event" would have been better – this might be a recommendation for best practice.

It is not surprising that the greatest challenge was the encoding of the different versions. For the wind instruments, the readings regularly are empty, except in the version (Haydn 1780 or Haydn 1783) that makes use of the instrument concerned. I was not able to encode all of the minor modifications precisely, because at the time I undertook the conversion,³ it was not possible to have an `<app>` element within a beam even though this is the usual approach in critical reports ("second note f instead of g"). Due to editorial conventions, it should be possible as well to mark up single supplied notes within a beam. It seems to me very reasonable to treat the note, the smallest semantic entity in music, as an individual element. My most serious problem, however, derives from the fact that all five versions are of different length. As a consequence, I had to deal with a phenomenon that might be called angle-bars or hinge-joint-bars.

I would like to illustrate this difficulty this by a brief look at the fifth version (Haydn's version of 1783). In this arrangement, two measures (60 and 60f) are contracted to a new one. I have encoded the fourth beat of measure 60 as an empty reading; in the bassoon, I have qualified the `<mrest/>` with a gestural duration of 3 beats. In the upbeat (measure 60f), I have supplied a quarter rest for the bassoon; in the other parts, I have qualified the first three beats as empty readings.

³ The schema has since been improved.

This solution shows that MEI is able to cope with very complicated editorial problems. It is free enough to allow individual editorial approaches within a given standard. Therefore, MEI is very promising for future scholarly editing.

MEI editor

Julian Dabbert

The MEI editor currently in development aims to enable the users to view and graphically edit MEI-encoded music documents in CWN (Common Western Notation). The supported function set is only a subset of the features contained in MEI, excluding more exotic features such as medieval neumes and features that are graphically complex to implement. This reduction in scope strives to enable the realization within the frame project TextGrid's runtime ending in summer 2012. Work on the featured component MEI editor begun in December 2009 and is scheduled to deliver a working feature-wise downscaled prototype by fall 2011.

The technical conditions of the implementation are set by the prerequisites of the embedding project TextGrid to the programming language Java 1.5 and the platform eclipse RCP (Rich Client Platform) in version 3.5. The graphical editor is based on the GEF (Graphical Editing Framework) which provides generic base services for editing as well as the necessary flexibility for adapting the framework to the domain of music notation.

Use Cases for the MEI Editor:

- Graphical display of existing MEI documents for proofreading
- Export of MEI documents to image files (e.g. Incipits)
- Creation and manipulation of MEI documents on a graphical level
- Display for critical review using dynamic switch of variant sources

The use of the format MEI offers various advantages for the implementation of a music notation editor:

- Sourcecode of documents is readable for humans as well as computers
- Simple (De-)Serialization of the XML data structure
- Proper support of XML concepts enables sensible use of formatted text comments (correct HTML)
- Display of variants is a unique feature offered by the MEI editor

Up to this point in its development, no conceptual deficiencies of the format MEI have been discovered.

There were various reasons to develop an all-new notation program rather than extending an existing one:

- A seamless integration into the embedding framework of TextGrid can only be achieved safely by using the same technology as TextGrid
- The use of modern architectural concepts and programming languages simplifies maintenance and further development as well as future relevance of the application

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- The in-house development of the MEI editor grants independence and control over the process of development and design targets, safeguarding that the original development goals are met
- The seamless integration of the unique variant concept requires reflection within the fundamental data structures of the note editor. Since currently no comparable music notation editors with variants are known, a proprietary development is necessary

From the developer's point of view, the desired path of development moves toward an unambiguousness of expression: if there are many permissible ways to express the same idea within the MEI document, each of these valid paths would be required to be readable by a parsing program.

The following screenshot is a demonstration of the current development state of the note editor. The blue-colored notes on the right-hand side are notes only contained in the currently selected variant source, whereas the black-colored symbols are contained in all known sources. The window below displays the properties of the selected element and enables their direct editing. On the left-hand side on the top is a file browser for selecting and opening MEI documents. The outline window below offers an overview and a quick navigation within the currently opened MEI document.

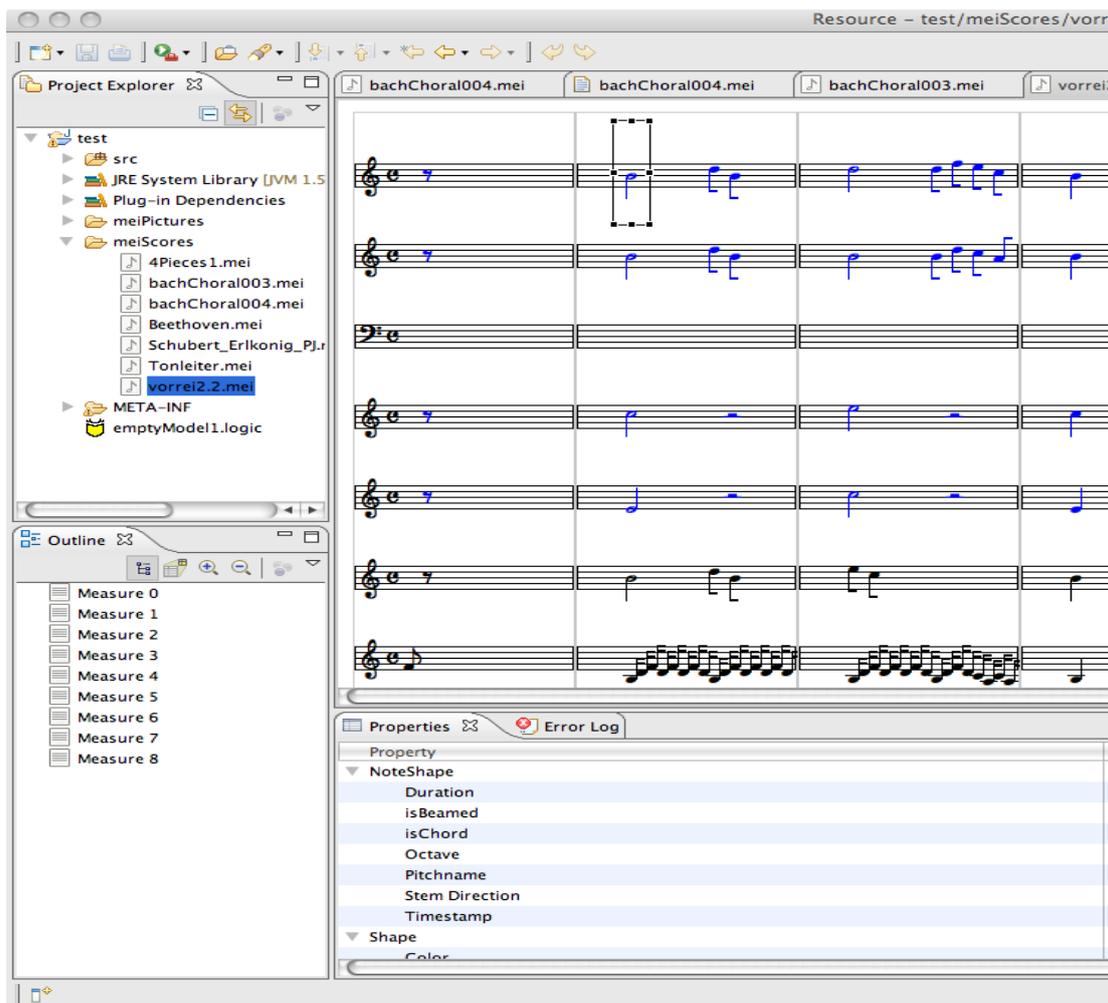


Fig. 11.1: Current development state

Case Study Report: Debussy's *Syrinx* (La Flûte de Pan)

Raffaele Viglianti

Syrinx (*La Flûte de Pan*) by Claude Debussy (1862 – 1918) is a short piece for flute solo (35 measures) originally composed as theatrical interlude under the title *La Flûte de Pan*. Despite Debussy showed little interest in the publication of the piece (it was first published posthumous with the title *Syrinx*), the first performer, Louis Fleury, contributed to the reception of the piece as independent from Mourey's play. The piece still maintains a relevant role in the solo flute repertoire.

The first edition by Jobert (FEJ)

Fleury died on 10 June 1926,⁹ and *La Flûte de Pan* was only published one year later by Jobert (August 1927, plate number J.J. 344), nine years after Debussy's death. Jobert issued the piece under the title *Syrinx*, probably because the first song in Debussy's *Chansons de Bilitis* (1897-1898), also published by Jobert, is titled *La Flûte de Pan* (Vallas, 1933). According to Lesure's (1977) index of the works of Debussy, the manuscript source used for the first edition has not been located and is possibly lost. The edition itself consists of two pages of printed music: the first one contains the front matter, which includes the dedication: 'à Louis Fleury', and five systems; the second one contains eight systems.

The Manuscript Brussels (MSB)

The first edition (FEJ) has been the only source available for subsequent editions of *Syrinx* until 1991, when Ljungar-Chapelon prepared a facsimile edition of a newly discovered manuscript source. This manuscript is part of the private collection of Madame Hollanders de Ouderaen in Brussels and is dated November 1913 and signed 'Claude Debussy'. Although it has not been possible to consult the original manuscript first hand or to discover how Mme. Hollanders obtained it, according to Ljungar-Chapelon it constitutes a primary source. In 1996, in collaboration with Stegemann, Ljungar-Chapelon produced a new edition of *Syrinx* (*La Flûte de Pan*) that used the manuscript as a base text (Stegemann and Ljungar-Chapelon, 1996). What Stegemann reports as being the decisive evidence for the relevance of this source is the theatrical cues written on top of 1 *recto* and in between m.8 and 9. Vallas (1933) deduces that *La Flûte de Pan* was supposed to be played at the end of *Psyché*, when Pan dies. However, this theatrical cues help to collocate the incidental music within the play.

Given the short time that Debussy was able to dedicate to working on this piece and the haste in which it was prepared before leaving for Moscow, it is possible that this manuscript was either copied by Fleury from Debussy's sketch or written in strict collaboration by the two (Stegemann and Ljungar-Chapelon, 1996). Several slips of the pen might indicate quick writing: m.9 and m.25 are partly written over a system extended on the right margin, two

⁹ As confirmed by an obituary on *The Musical Times*, Vol. 67, No. 1002 (Aug. 1, 1926)

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slurs are corrected (m.6 and m.25-26) and, interestingly, there are three errors in rhythm (m.1, m.6, m.22 and m.24) and a missing barline between m.22 and m.33.

Other secondary sources

In 1922 Fleury wrote an article in the British journal *Music and Letters* entitled *The Flute and its Powers of Expression*. In this article Fleury discusses specific features of the character of the flute. To describe “*Melancholy[sic] sweetness*” (Fleury, 1922: 386), Fleury picks several examples, including a *Sicilienne* from the second movement of the E \flat sonata for flute and clavier, and few measures form a piece by Debussy: *La Flûte de Pan*.



Figure 12.1: Three measures of *La Flûte de Pan* as quoted by Fleury (1922).

These three measures (MLF) are different from both FEJ and MSB: the key is E \flat minor instead of B \flat minor and there are missing slurs, dynamics and tempo markings. The first measure is very similar to m.9 in FEJ and MSB; likewise, the third measure in the figure is very similar to the beginning of m.12 in FEJ and MSB. The second measure, on the other hand, is strikingly different: the tempo is changed from 3/4 into common time and only the last two beats are the same as in m.11 in FEJ and MSB. The first two beats are completely new; although they resemble m.27 in FEJ and MSB, where similar pitches occur at a higher octave. Nevertheless the alterations of the grace note and the following semiquaver are different (F \flat and E \flat instead of F and E \flat).

At this time, Fleury is the only performer with access to the piece; it is therefore important to consider this fragmentary source, since he was very likely in possession of Debussy's autograph manuscript or a copy of it. This secondary source, therefore, might provide an alternative version of m.9 to m.12, but because of the wrong key and other inaccuracies in other examples quoted in the same article, the possibility exists that Fleury quoted from memory or consciously or unconsciously altered the text.

Digital Edition

As was the case for the Stegemann and Ljungar-Chapelon edition (1996), the base text for the case study edition is MSB. FEJ is employed to amend passages unclear in rhythm (especially m.1, m.6, m.22 and m.24) and unclear phrase marks (i.e. m.25-26). This present edition does not claim to significantly improve on Stegemann's and Ljungar-Chapelon's work, other than considering the additional secondary sources previously mentioned and investigating the potential for digital representation and presentation.

TEI is the standard most commonly employed for digital editions in textual scholarship. Version P5 of the TEI Guidelines (the latest available) proposes recommendations for the encoding of manuscript descriptive metadata (chapter 10), representation of primary

sources, including editorial conjecture (chapter 11), and variant readings (chapter 12).¹⁰ However, TEI does not provide a module for the representation of common western music notation. Initially the use of a combination of TEI and MusicXML was considered for this edition; however, MusicXML cannot match TEI's flexibility when encoding primary sources and variant readings. MusicXML, in fact, is primarily designed 'to be sufficient, not optimal' (Good, 2001); therefore, it represents normalised common western music notation to facilitate interchange and does not allow the flexibility in the granularity that might be required when representing the editor's interpretation and understanding.

The Music Encoding Initiative (MEI) provided an alternative choice.¹¹ This XML format is modelled on TEI and attempts to follow the same principles. In particular it specifically focuses on formalising interpretation through declarative knowledge and claims to be independent from rendering software while also addressing processing matters (Roland, 2002). Moreover, it includes a module for the representation of variant readings and transcription of primary sources; therefore a combination with TEI did not seem to be necessary.

Encoding of information about sources

Similarly to TEI, MEI provides a "header" (<meihead>) that allows documenting information about the digital file and its sources. This portion of the representation contains metadata that records bibliographic information, observable facts about the sources and encoding methods employed in the representation of the music. The element <meihead> is composed of four sections: file description, encoding description, profile description and revision description.

File description (<filedesc>)

This element contains bibliographic information about the digital document itself, including information about the sources from which the electronic document is derived, which is encoded with the child element <sourcedesc> (source description). In the case of *Syrinx*, <sourcedesc> contains the description of the three sources employed for this edition. Each source has an identifier assigned that can be used to associate readings with a specific source.

```
<sourcedesc>
  <source id="MSB">
    <!-- Bibliographic Metadata -->
    <!-- Physical Description -->
  </source>
  <source id="MLF">
    <!-- Bibliographic Metadata -->
  </source>
  <source id="FEJ">
    <!-- Bibliographic Metadata -->
  </source>
</sourcedesc>
```

Example 12.1: List of sources in MSB. Each element <source> holds more specific data.

¹⁰ <http://www.tei-c.org/release/doc/tei-p5-doc/en/html/index-toc.html>

¹¹ <http://www.music-encoding.org/>

While the source description of FEJ and MLF is mainly bibliographical, the description of MSB includes observable facts about this handwritten primary source.¹² The element `<physdesc>` (physical description), for example, contains data about the dimensions, the conditions and the location of the manuscript. The physical description also includes a list of the hands identified on the document. Hands do not necessarily correspond to scribes, but to “characteristics of writing observed in the manuscript” (TEI P5 Guidelines, chapter 10).

According to Stegemann and Ljungar-Chapelon there are three different hands on MSB: a first one (h1) wrote the composer name and work title on 1 *recto*; a second one (h2) is the main hand that wrote most of the notation in blue ink; finally a third one (h3) wrote two additions in pencil.

```
<handlist>
  <hand id="h1" medium="ink">Title page.</hand>
  <hand id="h2" medium="blue">
    Main hand, music notation.
  </hand>
  <hand id="h3" medium="pencil">
    Two additions: the mezzoforte in
    <ref plist="m6">m. 6</ref> and "un peu" just before
    mouvementé in <ref plist="m9">m. 9</ref>.
  </hand>
</handlist>
```

Example 12.2: List of hands in MSB. The element <ref> is a link to the measures mentioned.

After the physical description, it is possible to add further notes with the element `<notesstmt>` (notes statement). In this case it has been employed to record further data about the surrogate sources employed to collect information about the manuscript (that are Ljungar-Chapelon, 1991; Stegemann and Ljungar-Chapelon, 1996).

Encoding Description (`<encodingdesc>`)

This element is used to declare the criteria used for the collection of data and its representation. Notably, the child element `<editorialdecl>` (editorial declaration) contains specific information about editorial intervention in the music. In particular it documents criteria used for corrections, normalisation and interpretation. The element `<editorialdecl>` has been used to record the encoding criteria adopted to represent the notation in measures.

```
<measure>
  <staff>
    <layer>
      //- Notes
      <note>, <beam>, <tuplet>, etc.
      ...
    </layer>
    //- Phrase marks
    <slur>
    ...
    //- Dynamics, tempo markings and
      directions positioned above the staff
    <dir>, <dynam>, <breath>, etc.
```

¹² The organisation of the elements in the source description for MSB attempts to emulate the much more detailed encoding model offered by the TEI manuscript description module. See chapter 10 of the TEI Guidelines: <http://www.tei-c.org/release/doc/tei-p5-doc/en/html/MS.html>

```

...
// - Dynamics, tempo markings and
    directions positioned below the staff
<dir>, <dynam>, <breath>, etc.
...
    </staff>
</measure>

```

Example 12.3: Encoding criteria for notation.

Profile Description (<profiledesc>)

This element is used to describe further aspects of a musical text, which do not belong to a more typically bibliographic description.

Revision Description (<revisiondesc>)

This element is used to outline the revisions carried out on the file. Although it can be very useful to coordinate teamwork or just for personal use, it has not been used for the case study edition.

Representation of variant readings

The representation of notation in an encoding model is substantially different from a paper-based edition: instead of fixing in writing the results of the editorial work, the encoding represents all variants and singles out the reading chosen for the edited text. Therefore, the MEI file represents this edition's base text (MSB) and adds additional information every time a difference in the other sources occurs. If the sources agree, it is expressed silently. This criterion is identified by the TEI guidelines as 'internal parallel segmentation' (see TEI guidelines, chapter 12).

The encoding model for representing variants employs the element <app> (apparatus), which contains a series of elements <rdg> (reading), one for each source. With the exception of m.22, which will be discussed later, FEJ and MSB always agree on pitch; on the other hand phrase marks, tempo directions and dynamics are often different. Variant readings in *Syrinx* can either consist of alternative notations, or consist of the presence/absence of notation. An example of the alternative notation can be found in m.28, where in MSB a phrase mark spans the last two beats of the measure, while in FEJ there is a phrase mark for each beat.

```

<measure id="m28" n="28">
  ...
  <app>
    <rdg source="MSB">
      <slur staff="1" tstamp="2" dur="4" place="above"/>
    </rdg>
    <rdg source="FEJ" type="ed">
      <slur staff="1" tstamp="2" dur="2.875" place="above"/>
      <slur staff="1" tstamp="3" dur="3.75" place="above"/>
    </rdg>
  </app>
  ...
</measure>

```

Example 12.4: Alternative phrase marks in m.28 from source MSB and FEJ.

Example 12.4 shows the encoding model of <app>; notably, <rdg> contains the attribute source that points back to the source description in the header. The attribute type with value "ed" classifies the reading as the one that has been chosen by the editor. In this specific

case the reading offered by FEJ has been preferred since it is consistent with the phrasing usually associated with the first theme in both MSB and FEJ. It is worth explaining the basic mechanisms behind the element `<slur>`, since they are also common to other elements. The attribute `staff` defines to which staff the phrase mark belongs to; `place` defines whether the slur has to be rendered above or below the staff; `tstamp` identifies the beat in which the slur starts and `dur` the beat in which the slur ends. Beats are counted from the beginning of the measure (where 0 is the opening barline) and always end with the number of beats in the measure plus one (the closing barline).

Examples of variants with presence/absence of notation are much more common in *Syrinx*. In m.16 and m.17, MSB presents the equivalent notation of a *subito piano*: a crescendo sign followed by **p** on the first beat of m.17. However, in FEJ, the **p** is missing.

```
<measure id="m17" n="17">
  ...
  <app>
    <rdg source="MSB" type="ed">
      <dynam place="below" staff="1" tstamp="1">p</dynam>
    </rdg>
    <rdg source="FEJ" />
  ...
</measure>
```

Example 12.5: Presence/absence of notation in m.17 from source MSB and FEJ.

Editorial conjecture, intervention and annotations

Addition (`<add>`)

In transcribing sources it is possible to record the interpretations of addition, deletions and abbreviations that are identified in the musical text. Of these three possible scenarios, only additions have been identified in MSB. Additions are portions of text of music notation that are identifiable as insertions and are encoded with the element `<add>`. The left barline in m.1 is drawn only in the first staff, but subsequently the barline is redrawn spanning two staves; the tie between C_b in m.6 and C_b in m.7 is first written to the end of m.6 and then rewritten to C_b in m.7; a slur starting in m.25 is first drawn to the middle of the key signature in m.26 and then extended to the first note in m.26.

However, the first case could not be represented using `<add>`, because the barline is represented with an attribute. Attributes cannot be surrounded by elements (such as `<add>`) since their function is to record a predicate about the element of which they are part. However, in the case of transcription of primary sources, it seems necessary to be able to include barlines in the hierarchy of elements. It is indeed possible to permit both representations: as discussed in chapter 2, flexibility of granularity becomes fundamental to the modelling of XML-based digital editions.

Change of hand (`<handshift>`)

Another interpretation that can be recorded in transcribing a manuscript source is the portions of music written by different hands. As described above, it is possible to record the presence of different hands in the document header with the element `<handlist>`. The exact location of the shifts from one hand to another are marked with the empty element `<handshift/>`.

```
<measure id="m6" n="6">
```

```

...
<handshift old="h2" new="h3"/>
<dynam place="below" staff="1" tstamp="1">mf</dynam>
<handshift old="h3" new="h2"/>
...
</measure>

```

Example 12.6: Change of hand in m.6 (MSB).

Example 12.6 shows the representation of an *mf* in m.6 that has been written in pencil. The first element `<handshift old="h2" new="h3"/>` implies that all the subsequent encoding is to be considered written in the hand h3, until the next `<handshift old="h3" new="h2"/>` resumes the hand to h2. This encoding, therefore, is a different kind of statement from the ones that have been explained so far. Instead of including data within the element, `<handshift/>` encodes the location of a change, which can be used to computationally determine to which portion of the encoded music a hand applies to.

Correction (<sic> and <corr>)

These elements record a specific interpretation of the transcriber, which specifies whether music notation is considered incorrect or inaccurate (<sic>) and proposes a correction for it (<corr>). These elements are always contained by the element <choice>, which is used to group alternative encodings of the same music notation. There are three rhythmic incongruities in MSB for which it is possible to provide an alternative correction. In m.1 the last four notes are quavers, thus bringing the measure to 4/4 even though the tempo is in 3/4. Therefore, the correction proposes semiquavers instead of quavers, as it is possible to determine from other occurrences of the same notes throughout the piece. M.6 does not add up to 3/4 having a dotted quaver rest is followed by a demisemiquaver and a crotchet. Therefore it seemed necessary to propose a correction of rhythm for the demisemiquaver into a semiquaver and for the crotchet into a minim.

```

<measure id="m6" n="6">
...
<choice>
  <sic>
    <note pname="a" oct="5" dur="32" stem.dir="down"/>
  </sic>
  <corr>
    <note pname="a" oct="5" dur="16" stem.dir="down"/>
  </corr>
</choice>
...
</measure>

```

Example 12.7: Correction of rhythm in m.6 (MSB).

Supplied notation (<supplied>)

Additions supplied by the editor can be encoded with the element <supplied>. It is possible to specify the reason for the addition with the attribute reason; values for this attribute can be restricted to a closed list if necessary. For this edition only two reasons have been identified: *normalisation* and *omitted*. The former has been employed to mark added cautionary accidentals and the latter for the completion of a direction mark in Italian (m.34 MSB: *perdendo[sij]*).

```

<measure id="m15" n="15">
...
<note grace="unacc" pname="g" oct="4" dur="8" stem.dir="up">
  <supplied reason="normalisation">

```

```

    <accid value="n" func="caution"/>
  </supplied>
</note>
...
</measure>

```

Example 12.8: The encoding of a supplied cautionary accidental in m.15.

Annotations (<annot>)

This element is used to record annotations of different kind. Annotations often refer to a specific group of events in the notation, which can be listed in the attribute plist (pointer list). For this case study, annotations have been used to add additional descriptive information about the primary source that was not possible to encode or when a verbal description was considered sufficient. Annotations are distinct in annotations about *notation* (referring to elements of notation) and *structure* (referring to underlying objects, such as staves and system breaks).

```

<measure id="m5" n="5">
  ...
  <annot source="MSB" plist="m5n1 m5n2 m5n3 m5n4"
        targettype="notes" type="notation">
    Stems down.
  </annot>
  ...
</measure>

```

Example 12.9: Annotation in m.5 (MSB) describing the stems of the notes listed in plist.

Problematic cases

Measures 22 and 23 (MSB)

On top of MSB 3 *recto*, after four staves probably left empty to align the notation with 2 *verso*, there is a measure with a number of problems in rhythm. Notwithstanding the 3/4 time stated at the beginning of the piece, this measure spans 6.5/4, which leads to think that there is some sort of mistake. Interestingly, the very first quaver (B) is tied with the crotchet that ends m.21 and is beamed with two following triplets of semiquavers, covering a quarter and a half. Moreover, a slur covers the quaver and the triplets, thus reinforcing their status as a group. The two following groups delimited by beaming and phrase marks cover one beat each and so do the three following crotchets, trill and crotchet. The first quaver then, seems to be extra and the last three beats could form a measure by themselves given the similarity with m.24. Perhaps the first quaver was added as a reminder of the last note from the previous measure located at the bottom of 2 *verso*; however, this theory is discredited by the grouping of the note with the triplets. The division in two measures is instead more expected; probably the scribe forgot to draw the barline.



Figure 12.2: The proposed division of the first measure in MSB 3 *recto*.

The printed source FEJ seems to confirm this interpretation and also proposes a clarification of the notation in m.22. FEJ does not have the first quaver and extends the slur marking the tie to the first note of the triplet, which is also a B. This seems a logical solution since it reflects a melodic idea starting on the last beat of m.19 that has crotchets always tied to the first note of groups of quaver and triplet or of two triplets.

This problematic measure has been represented in the MEI document as two measures with a missing barline (in MSB) encoded with the element `<gap>` (see Figure 12.2). Representing both sources, however, has required an encoding more complex than in other parts of the document. This is mostly due to the inexact rhythm in MSB. As previously described, the first quaver (B) is not present in FEJ and the tie ends to the first semiquaver of the triplet. Usually beamed notes are grouped inside the element `<beam>` and the encoding of two different beaming would require the repetition of the beamed notes.

However, since it has been considered good practice to avoid repetition of notation as much as possible, in this specific case the element `<beamspan/>` has been adopted. Similarly to `<handshift/>`, this element marks only the beginning of the event and subsequent notes refer back to this declaration with the attribute `beam`.

```
<measure id="m22" n="22">
  ...
  <app>
    <rdg source="MSB">
      <beamspan staff="1" tstamp="1"/>
      <note pname="b" oct="4" dur="8" beam="i1"/>
    </rdg>
    <rdg source="FEJ" type="ed">
      <beamspan staff="1" tstamp="1" breaksec="8 8"/>
    </rdg>
  </app>
  ...
  <app>
    <rdg source="FEJ" type="ed">
      <barline rend="single"/>
    </rdg>
    <rdg source="MSB">
      <gap reason="missing barline"/>
    </rdg>
  </app>
  ...
</measure>
```

Example 12.10: Different beaming and barlines in MSB and FEJ.

Fragmentary sources

As mentioned above, there is no encoding of variants when the sources agree. This approach, however, introduces a complication in the case of fragmentary sources like MLF since, in order to maintain this approach, it becomes necessary to mark up the beginning and the end of the fragmentary source. Doing so implies that the music notation after the marker is common to all sources including the fragment and variant readings will also consider the fragmentary source. TEI proposes (chapter 12, §12.1.5 of the guidelines) the elements `<witStart/>` and `<witEnd/>` to mark the boundaries, suspensions and resumption of the fragmentary sources. The use of these elements seemed necessary to correctly encode the variant reading offered by MLF, but unfortunately MEI does not have an equivalent encoding. These boundaries are currently marked by annotations, but a

proposal for the inclusion of equivalent elements has been submitted to the MEI community based on the practical work carried out here.

Presentation and interactivity

It has been previously discussed that data stored in an encoded document can be manipulated to extract specific information for display or for further manipulation. For this edition, a number of different perspectives from the MEI document are selected using the XSL Transformations (XSLT) scripting language, which is specifically designed to extract information from an XML file and serialize it into another document (i.e. another XML file, HTML or plain text).¹³ Additionally, Mup, a program that converts its own notation format into vector graphics, has been employed to display music notation;¹⁴ a basic XSLT script to convert MEI into Mup is provided on the MEI website under an Educational Community Licence.¹⁵

To extract musical information from the encoded edition, a heavily customised version of the MEI to Mup script converts a specific selection into Mup format and Mup converts it into vector graphics. This process involves different technologies and loss of information; however, 'it is too little acknowledged that multiple data sets may be used in the progressive phases of a single application and that in consequence the attributes available from one stage to the next are not necessarily uniform' (Selfridge-Field, 1997). Indeed, even though the information contained in the resulting Mup files is not as rich as the MEI encoding, the information lost is in fact only left out where it is not part of the information necessary to generate a specific display.

The edited piece

A first perspective rendered in music notation is the edited piece. An XSLT script extracts all the variant readings marked with `type="ed"`, includes the editorial interventions marked with `<supplied>` and creates a new MEI document tree containing only the notation for the edition. This tree is then serialised into Mup language. Opening the resulting file with Mup allows the generation a vector graphic version of the notation that can be visualised as PDF.

Synoptic apparatus

Instead of printing a traditional apparatus, this edition proposes a synoptic apparatus of the two main sources (MSB and FEJ). This is automatically built to display measures that contain variant readings. Moreover, it has been programmed to display the notation of the two sources in a semi-diplomatic manner and excluding editorial intervention. Manuscript sources such as MSB, often contain non-standard notation, therefore semi-diplomatic display can be complex. Some elements had to be left out for this prototype, especially *diminuendo* and *crescendo* signs that span across a barline.

Table of annotations

Music notation is not the only kind of information that can be extracted and manipulated automatically. An XSLT script has been programmed to create an HTML table of the annotations in the document organised by type and collocation.

Breath marks

¹³ <http://www.w3.org/TR/xslt>

¹⁴ <http://www.arkkra.com/>

¹⁵ <http://www2.lib.virginia.edu/innovation/mei/Software/> ; licence: <http://www.opensource.org/licenses/ec12.php>

MSB has fewer breath marks than the first edition FEJ. Since the piece has been written quite hastily, it is possible that Debussy did not provide all the breath marks necessary for performance. Moreover, Debussy rarely notated a sufficient number of breath marks in music for wind instruments (Ljungar-Chapelon, 1991). Trevor Wye (1994), in his edition of *Syrinx*, introduces a number of recommended breath marks to support the performance. Since Wye employs MSB as a base text, his breath marks are suitable for this edition's notation as well. In particular m.31 in FEJ has a breath mark after the first crotchet (D); however in MSB the crotchet is tied to the following note, therefore it is impossible to include a breath mark. The encoding for this case study edition includes Wye's additions with the element `<add resp= "Wye">`. The XSLT programmed to transform the edited music notation can, if requested, include these marks in the Mup output.

Further development

The views created for this prototype are static; however it would be highly desirable to combine them in an interactive environment. A full digital publication, in fact, should include substantial written documentation about the editorial work, which would be linked with the notation and facsimile images of primary sources. The text of the edition might have connections with the annotations and with the apparatus to allow the user to bring them to the screen when needed. The notation might be mapped on facsimile images to allow some sort of alignment. The apparatus could be displayed in the synoptic or classical form, show editorial intervention or semi-diplomatic notation. Finally its interactivity could be enhanced, for example allowing moving measures on the screen and comparing them. Performers might be interested in seeing tempi or breath marks from other editions, like Wye's breath marks, and include them in the edition to be printed out with a printing device at home. Paper editions with a similar approach are not uncommon, but often include comparative tables of tempi and resolution of ornaments that cannot be directly included in the edited text.

Other forms of interactivity and interaction with other resources can be envisaged and specific editorial issues related to certain repertoires and composers might encourage further investigation of user-oriented interactive features. However, even though the Web is currently the preferred digital publishing environment, there still is not a straightforward method to output notation as HTML and possibly there will never be. The only possibility to publish music on the Web is through graphic information; however, newer Web technologies include systems delivering complex interactivity based on image formats. Google Maps, for example, shows how images can be made highly interactive through the superimposition of layers. Perhaps, this could be a possible technology to look at for further development of digital publications in this field.

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MEI Applied to Renaissance Music Prints

Laurent Pugin

The goals of the experiments were to evaluate how MEI fits the some needs for encoding Renaissance music prints, and more particularly how MEI could be used as an underlying format for a software application, Aruspix, developed specifically for creating critical editions of Renaissance music. The Aruspix software application has been thought and designed as a suite of tools that can be used throughout the editorial process, from its very initial step, the data input, up to the publishing stage, and including the source comparison task and the critical apparatus preparation. One of the strengths of Aruspix is its optical music recognition input system that enables the Renaissance music prints images to be automatically encoded. A built-in music editor makes it possible for the editor to easily correct the automatic transcriptions errors, if any. This automatic transcription feature not only provides the editor with the raw encoded material that is indispensable to any critical editing endeavor, but it also automatically generates links between the encoding and the images of the original prints. The links are extremely valuable when creating digital editions because they can be exploited at the other end of the process to highlight variants or special cases in the original source in the publishing digital environment. As a direct consequence to this, and because Aruspix does not act only as a music notation software that would be used to prepare a modern edition, there is a need for a format that can be used throughout the editorial process and that can encode both the original source(s) and the modern critical edition, enabling the second one to be created from the first one(s) without losing the relevant information.

If moving from the encoding of an original source to a modern critical edition is not expected to be particularly challenging in most cases with sources in common western music, performing the same task with Renaissance sources might be more problematic. It is very important to keep in mind that we are considering only the encoding here, with absolutely no judgment on the difficulty of the editorial task and on the complexity of specific cases. We are talking about the structure of the encoding in general, knowing that the editorial task might be complicated with any repertoire and with any type of music notation and that the rule is always to expect exceptions. The point here is that, in most cases with common western music notation, there is no need to deeply re-structure the encoding and/or to significantly modify the music notation in order to create a modern critical edition. We can reasonably expect a piano score to stay a piano score, and whole notes and quavers to stay whole notes and quavers. With Renaissance music prints, however, we should expect more significant changes to occur, and the required transformation can be explained by the nature of the sources that we will most often have to deal with when editing Renaissance music prints.

The first point is that the majority of the published repertoire of the time was not printed in scores, but in part-books or in choir-books. In part-books, each voice was printed separately in a distinct book, whereas in choir-books, each voice was printed separately but all in the same book, on one page, or more often on a pair of pages. Needless to say that both formats were intended for performance, and even if part-books are somehow similar to ensemble parts that we still use today for instrumental music, both formats are not used anymore and will certainly not be considered as a primary format for a modern critical

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edition. What we need in the first place is a score, and creating a modern critical edition out of Renaissance music prints almost always requires the different parts to be put together into a score.

Because of the mensural notation system, putting the parts together requires the actual duration of the notes and rests to be determined. Mensural signs, proportions, alterations, imperfections but also colorations have all to be taken into account in order to establish the actual duration of each note and of each rest. Of course, theoretically, the actual duration can be determined without putting the parts together, and so did the singers and instrument players of the time, but in an editorial process, the two steps are often accomplished side by side and putting the parts together often enable ambiguous signs to be correctly interpreted and errors to be detected and corrected. In the raw encoding of an original source as generated from an optical music recognition process, we should not expect the actual duration to be known because, to our knowledge, no algorithm can accurately interpret mensural notation rules, and setting or correcting the actual durations is still a task of the editor.

As another consequence to the part assembling is that some of the music symbols that we often find in Renaissance music prints cannot be kept and have to be transcribed. The typical example is the ligatures, which cannot be used in a score where the voices have to be aligned. They have to be transcribed to the corresponding note values. If this is not directly a problem, it underlines an interesting question which how to consider the differences between “mensural notation” and “common western notation” with cases where obviously we stand right in between.

In order to evaluate how MEI could be used to encode both original sources and modern critical editions and to see how we could deal in MEI with the differences described above, we selected two sources that were transcribed in Aruspix into both forms, the original source and a draft of a modern critical edition. A prototype function to export the data into MEI version 1.9b has been implemented in Aruspix. The selected examples were the “Exemplum ad proportionem” by Finck, and the “De Radice” by Isaac. Both examples are in choir-books, with voices containing different proportions, and include ligatures and coloration. In both cases, it was possible to encode both forms in a very satisfactory way. It was possible to encode all the information required, including ligatures and colorations, with one single exception for a proportion sign C inverted at the *Bassus* in Isaac. An additional attribute for the `<mensur>` element could be a possible solution to encode it. As far as the original sources were concerned, the data organization options available in MEI, namely by `<score>` or by `<parts>`, revealed themselves to be not very appropriate for choir-books. Even if it was possible to find a way to correctly encode them using `<sb/>` or `<pb/>`, none of the two seemed to be perfectly adequate for capturing the choir-book organization because the voices organization on the page is uncommon. At some point, it might be interesting for MEI to have an additional page-centric data organization that would facilitate the encoding of original sources. With this in hand, it would be possible to encode the music sources in a more music agnostic way, where the staff/layer organisation is not known, or not known yet. It is typically information that is added during the editorial process, most often by the editor himself. A page-centric data organization feature could certainly be useful beyond choir-books.

The Aruspix software application is still under development, and because one possible output format for the editions created within Aruspix, besides of course paper-based editions, can be dynamic digital editions to be consulted from the software application itself or from an on-line environment, MEI is of particular interest for Aruspix because it offers several key aspects for such a project. The encoding of the links to facsimile that can be

preserved and exploited throughout the process, and the critical apparatus encoding features are amongst the most interesting features. The advantage of MEI is also that the features offered are not specific to Renaissance music when there is no need to be to and when they can be identical with other music notations, which will greatly enhance readability, data exchange and data preservation.

**Exemplum ad proportionem subquintuplam &
ad sesquialteram.**

DISCANTVS.

The image shows a musical score for three parts: Discantus, Bassus, and Altus. Each part is written on a five-line staff with mensural notation. The Discantus part is the top staff, Bassus is the middle staff, and Altus is the bottom staff. The notation includes various note values, rests, and bar lines. The word 'Altus' is written at the end of the bottom staff.

BASSVS.

ALTVS.

Altus

Finck, "Exemplum ad proportionem"

In an encoding standard, such as MEI, which covers a wide range of notational systems, distinct modules are necessary in order to be able to organize the specifications. In the case of Renaissance music prints, if the aim is to encode original sources as well as modern critical editions, the use of the 'mensural' MEI module might not be easy to determine. In our experiments, however, it did not seem to be necessary, at least not for encoding the modern critical edition. It seems that not using it will facilitate the

transformation of the original source encoding into the publication target in terms of data processing. There is certainly no rule and other cases might require the use of the 'mensural' MEI module. A very encouraging outcome of the experiments was to see that all the improvement points that we found would not create backward incompatibility with the current version of MEI if they are added in the next version. In other words, they would all be addition that would extend MEI and make it more comprehensive.

S.
Sequent: *De radice Ies se propaginis hanc eduxit sol-*
verū lūmī nis manu sapiētie fux templū glo- rīe.

A.
Sequent: *De radice Ies se propa gins*
hanc eduxit sol veri lūmī nis ma-
nu sa piētie fux templum glo rīe.

T.
Sequent: *De radice Ies se propaginis*
hanc eduxit Sol veri Lūmīnis ma nu
sapiētie fux templum tēra pūm glo- rīe.

B.
 De radice Ies se propaginis hanc eduxit
Sol veri lūmīnis manu sapiētie
fux templum glōrie

Isaac, "De Radice"

The Use of MEI within the Edirom Project

Johannes Kepper

The Edirom project investigates methods for digital scholarly editions of music and develops software tools leveraging this task. Instead of creating editions on its own, the project relies on a number of collaborating complete works editions that use these tools and provide important feedback for further improvements. The tool portfolio consists of several related tools that allow complete workflows for creating and publishing digital editions. The core tool for editors is the so-called "Edirom Editor", which allows the preparation of all musical material needed for a digital publication. Since 2007, the Edirom Editor has used different versions of MEI as an internal data model for describing musical sources and their relationships and dependencies. The following article gives an overview of the reasons and methods for using MEI within the Edirom Editor.

Reasons for MEI

After a thorough evaluation of different music encoding schemes¹⁶, the Edirom project decided against using MusicXML, favoring MEI instead. Whereas the first offers a model sufficient for rendering / displaying music notation, only the latter allows consideration of editorial details such as distinctions between different scribes, retracing of compositional processes, inclusion of multiple readings, ambiguity, conflicting sources, and detailed source descriptions. MEI allows encoding, not only the musical content, but also the document containing this content.

However, this decision had certain consequences. Whereas MusicXML is supported by nearly all important applications in the field of music notation developed in the last couple of years, MEI had next to no software support in that time. Although this was (and still is) a serious drawback of MEI, it was no obstacle for using MEI within the Edirom project, as Edirom concentrated solely on facsimile-based editions in that time. MusicXML isn't capable of encoding all relevant details of facsimiles, and accordingly there is no software support for this special field even for MusicXML. Therefore, the Edirom project decided to use MEI, as it offered the most convincing data model, capable of storing all needed information, and the project had to develop all required applications itself anyway.

This decision is not a permanent exclusion of MusicXML, though. Actually, in some workflows it is already used to conveniently prepare data with existing commercial applications, which are then automatically converted to MEI and from thereon further enriched by specialized tools. This scenario's importance will increase significantly with the introduction of code-based editions (see below). In this context, MusicXML and MEI supplement each other in order to establish convenient and efficient workflows for digital scholarly editing of music.

¹⁶Johannes Kepper: „Notationsformate für Musik und ihre Edition. Eine kritische Bestandsaufnahme“, Paderborn 2007, Diploma Thesis

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MEI for facsimile editions

Whereas other projects using MEI concentrate on more distinct musical repertoires with graphically less diverse notational systems, Edirom has a clear focus on music from the CMN period. The complexity of this notation was one reason to rely on facsimile based editions in the first place, as this eliminated the immediate need to render music from code dynamically. Edirom uses the MEI's <facsimile> tag to annotate high-resolution images of musical sources with rectangles around every measure of a musical source. The measures themselves are encoded in a different branch of the MEI file, pointing to their corresponding rectangle. This design allows separation of the views on the musical content and its containing document and analogically follows corresponding models of the TEI. The combination of measures and rectangles is then used to dynamically overlay bar numbers in the facsimiles in order to provide access to the source for the users of the edition. Up to this point, there is no need to use any actual musical information beyond the fact that there is a number of measures within the source. Another reason to encode measures and rectangles, though, is that this permit the inclusion of critical commentary. MEI offers the facility to connect editorial annotations to those elements, which spares the need to decode circumstantial tables for the user. Thus, MEI greatly supports the accessibility of scholarly editions already with its simplest structures.

MEI for code-based editions

Nevertheless, convincing experiences from other projects dealing with other repertoires demonstrate that facsimile editions should not be the only solution for music from the CMN period. Luckily, there are already a couple of score renderers for MEI under development. The Edirom project intends to rely on a combination of TextGrid's MEISE tool, converted MusicXML and the Edirom Editor to prepare the musical contents of a source for a digital publication. Such a publication will be based on the next generation of the Edirom Publication tool, which itself will be based on the current Edirom Editor. As MEISE's architecture and design contradict a direct embedding into this configuration, a different solution for rendering MEI within Edirom is necessary. Currently, it is planned to rely on existing SVG renderers¹⁷ for music notation, which will be adapted to fit the special needs of MEI and Edirom. This includes transparent toggling between different variants and multiple readings.

The general approach of Edirom is to allow different perspectives on the same material. Therefore, an MEI-based rendering of the musical context will only serve as an addition to the facsimiles already provided in current versions of Edirom. Furthermore, it is intended to offer direct access to the underlying XML encoding, as this is the most transparent and precise expression of a digital edition. All these views will be connected, allowing the user to get from a spot on the facsimile to its encoding or code-based transcription or vice-versa.

MEI as an abstract model for describing source relations

MEI already lays the foundation for all this. But, whereas the encoding of the musical content itself is more or less straightforward following the MEI guidelines, the Edirom project has invested significant time to find an adequate model for source relationships. Normally, one MEI file contains all relevant sources of one work. Differences between those sources are microscopically described using MEI's <app> tag, which only encloses the actually differing parts. In the Edirom Editor, every source is designed as an object of its own, with the idea to reuse this very same object in different contexts without having to copy it (and

¹⁷Interesting candidates are <http://www.andreaswenger.de/zongviewer.html?lang=en> and <http://aruspix.net>. Whereas the first uses MusicXML, the latter already uses MEI, but is strongly focussed on renaissance music. Therefore further evaluations are necessary before an informed decision can be made.

thereby possibly lose information when only one representation of it gets changed). This necessitates use of a different concept for encoding works. The solution used by Edirom is based on MEI's <meicorpus> tag, which allows bundling of multiple MEI files together with a common header. This header is used to store all information about the musical work itself, whereas the headers of the source files contain only information about the sources. In order to keep the sources detached from the works, they are stored completely separate within the native XML-database eXist, which underlies all Edirom tools. Then, XInclude is used to transparently include the relevant sources into the work context. All objects are separately stored in distinct files that contain only information of immediate relevance. When necessary, these files are combined without actually changing them.

This approach necessitates a third kind of MEI file in order to be explicit about the source relations. When there are multiple sources for one work that witness differing numbers of measures, the model described before is ambiguous regarding the mapping of those measures. The combined encoding of a work and all its sources in just one file certainly contains a mapping of measures, but the separated model still seems more appropriate, as this mapping needs to be done explicitly. In this model, a separate MEI file acts as concordance of measures by providing a superset of all measures contained within the sources attached to a work. From this list, pointers refer to the corresponding measures in each source. Again, the benefit of this separated concordance file is that there may be different concordances for the same work, each based on the findings and decisions of one editor and not restricting other interpretations. Finally, all of these separated files can be integrated into one plain MEI file, which then can be exported to other applications if necessary.

This method of using MEI certainly introduces a notable overhead, but thereby facilitates a significantly improved approach to the sources and their relations in varying contexts.